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REPORT OF THE SECRETARY OF THE NAVY.

Secretary of the Navy Metcalf, in his annual report made public last week, dwells at some length upon the several notable events of the past year in navy circles.

With regard to the great cruise of the battleship fleet around the world, Secretary Metcalf calls attention to the splendid results, the ships having maintained schedule time and practically taken care of their own repairs on the entire cruise, which is now about half over.

The secretary points out that this undertaking has brought us into greater prominence in the eyes of those republics to the south of us, our own island possessions, Australia, Japan and other Oriental nations, and has cemented our interests to those of the countries visited in a more effective manner than has ever before been done.

In passing to the recent Newport conference, which was convened for the purpose of discussing the criticisms made of the new and larger battleships now building, the secretary says that after 43 days of consideration by this assemblage of the best authorities available in the navy, including 60 officers, all but seven of whom were of the sea-going branch, the design of these ships was approved, with the exception of a few minor details. Some of these alleged defects had been under consideration previous to the published criticisms, but they were not corrected owing to the fact that the designs had been made before the developments which proved superior were brought about. The secretary states that he feels no hesitancy in concurring in the view that the designs of the North Dakota and Delaware class are superior to those of any battleship now in course

of construction for any other navy.

Secretary Metcalf urges that the United States navy should, without delay, be provided with two vice admirals, since the officer in command of the fleet now is in the far east, as he holds the rank only of rear admiral, is in a position of subordination to foreign naval officers on important stations, who for the most part rank as vice admirals.

Among other recommendations is one that the dry dock authorized by congress to be constructed at Pearl Harbor, Hawaii, be built to a length of 1,140 ft., rather than 850 ft., in order that it may accommodate two or more vessels at once. Secretary Metcalf recommends that the navy yards at New York, Philadelphia, Norfolk, Puget Sound and Mare Island be developed to their fullest capacity for the repair and maintenance of ships, but he does not believe that other navy yards should be further developed, at least until that at Guantánamo shall have been fully equipped, the last-named being regarded as of the first military importance and as a natural strategic base.

The secretary deems it highly advisable to acquire by purchase or construction a dock in San Francisco harbor, after which the development of the Mare Island and Bremerton navy yards will make the acquisition of another navy yard on that coast unnecessary for some time to come.

On the subject of organization of the department, Secretary Metcalf says:

"Many of my predecessors have submitted comments and recommendations concerning the reorganization of the navy department, and from time to time changes have been made with a view to simplifying administrative methods and more clearly defining the responsibilities of the various

bureaus. While it is easy to criticize, however, it is exceedingly difficult to demonstrate the practicability of any scheme which would involve radical changes in the present departmental organization.

"The navy department, under our system of government, must necessarily be a group of organizations under the control of the commander in chief, the president of the United States, acting through a member of his cabinet, the secretary of the navy.

"The business of the navy department is so extensive and varied that its grand divisions must of necessity be under the immediate supervision of individuals having special qualifications and training which will fit them for their responsible duties.

"The enlistment and control of the personnel of the fleet, the responsibility for the discipline and movements of the fleet, the supervision of training stations, target practice, and other matters which directly bear upon the efficiency of the fleet, must naturally be under the direct supervision of an officer of the highest attainments and large experience as a sea-going officer. The bureau of navigation of the navy department, which has direct responsibility for all the foregoing work, would seem, therefore, to be an imperative necessity, and its duties could not well be merged in or distributed among those of any other bureau."

The navy department being a large business organization, Mr. Metcalf suggests rearrangements of the duties of any bureau are exceedingly difficult and complex, and necessarily rest with congress; but those who speak of the millions unnecessarily spent annually by the lack of economical administration do not realize that a comparatively small percentage of the annual budget goes for

repair and maintenance of the material of the fleet.

The greater part is expended for the pay and provisioning of the navy and marine corps, ammunition, fuel, and expenditures on account of increase of the navy. So far as concerns the last-named item, the department has long been an exceedingly economical purchaser, the contract price of our latest battleships being hardly more than the actual cost of labor and material and incidental expenses, and very considerably below the limit fixed by congress.

The secretary says also that it would be difficult to find in any large manufacturing establishment, or other industrial organization, greater co-ordination than exists among the heads of the great bureaus and offices of the navy department.

The secretary recommends that congress authorize at its approaching session the construction of four battleships, four scout cruisers, 10 destroyers, four submarines, three colliers, one repair ship, one ammunition ship, and two mine-laying ships—these two ships to be converted from cruisers now on the navy list.

BUREAU OF CONSTRUCTION REPORT.

Chief Constructor Washington L. Capps, United States navy, avails himself of the opportunity offered by the publication of his annual report to make a vigorous reply to his critics. After tracing the development of the designs of the North Dakota, he points out that the criticisms of Commander Key were made 18 months after the formal approval of the design for this battleship. He says:

"It appears, from the official records of the department, that a period of more than 18 months elapsed after the formal approval of the design of the North Dakota by the secretary of the navy before official criticism of that design was submitted to the department by an officer whose duty in Washington with the general board and at the yard where the North Dakota was being built gave him unusual opportunities for obtaining definite information concerning the principal characteristics of that design.

"Allusion to the above-noted circumstances and dates is considered of importance by the chief constructor, since some of the publications heretofore used as a medium for the dissemination of unwarranted adverse criticism concerning the material of the navy have contained specific statements to the effect that the communi-

cation criticising the design of the North Dakota was suppressed and pigeonholed in the bureau of construction and repair. The most casual inquiry would have elicited the fact that this communication was not referred to the bureau of construction and repair but to the board of construction, and that when it reached that board one of its members—the chief constructor—was under orders for distant duty, obedience to which could not be delayed, as it involved taking passage with the Atlantic fleet. This fleet was scheduled to leave San Francisco early in July, and the chief constructor actually reported at San Francisco on July 3."

Commenting on the results of the Newport conference, this is added:

"It appears, from the official documents in the case, that the changes recommended in the design of the North Dakota, as a result of the deliberations of the Newport conference, are of comparatively minor character, and the more important of these related to subjects which for a long time previous to the calling of the Newport conference, had been given careful consideration by the department and its responsible bureaus in connection with their regular work of keeping abreast with and anticipating developments in naval material. These developments are constantly in progress in all navies and inevitably necessitate minor changes in design during the progress of the construction of the vessel, and therefore cannot properly be regarded as inherent defects in the original design of any vessel.

"There are now and must always be differences of opinion among officers having responsibility in connection with the design of naval vessels, their armament and equipment, as to the best compromise development of the various features essential to a satisfactory design of battleship, but the fact that the Newport conference, composed of more than 50 officers of the seaman branch of the navy and only four officers of the construction corps, should after mature deliberation have expressed itself so positively concerning the merits of the North Dakota design is in itself a complete refutation of the numerous ill-considered adverse criticisms which have appeared from time to time in the public press concerning the designs of this vessel. The action of the Newport conference with respects to the designs of the last two vessels of the North Dakota class, viz., the Utah and the Florida, proposals for which vessels had not at

that time been issued, and the plans for which were in course of preparation, still further accentuates the feeling of the conference with respect to the general excellence of the designs of the North Dakota."

The need of additional dry docks is pointed out in this report. The new stone docks at Norfolk, Va., and Charleston, S. C., are not yet available for use. There is only one dock on the Pacific coast in which a battleship can be docked. As to the docks at the New York navy yard, he says: "The large wooden dry dock at this navy yard, which has been the principal battleship dock for more than 10 years, is now reaching a stage of deterioration which makes it advisable to undertake extensive repairs as soon as possible. Dry dock No 2 has deteriorated to a still greater extent during the past year, and is now in such condition as to render its use in docking large battleships inadvisable except in cases of emergency."

SNOHOMISH GOES TO ALASKA.

The new tug Snohomish, of the revenue cutter service, said to be the first vessel ever designed and built exclusively for life-saving work, has sailed from Norfolk on a voyage of nearly 20,000 miles to the station which she is to occupy on Neah Bay, on the Alaskan coast.

The Snohomish carries all the standard equipment for such work and in addition is fitted with a device which is designed for the saving of life when no other means will avail. This is a marine cableway and breeches-buoy which will work no matter what the condition of the sea may be.

The sending of the Snohomish to this station is the result of the loss of the steamer Valencia with 136 lives in the straits of Juan de Fuca, at the entrance to Puget Sound, two years ago, the government having decided to provide a means for saving lives so often endangered in these somewhat treacherous waters.

The cableway with its breeches buoy is an adaptation of the well-known breeches buoy principle to the conditions of storm and stress. The essential principle of the cableway is an automatic reel, which gives and takes on the cable attached to the masthead of the wreck and to the masthead of the rescuing vessel so that there is constantly on the cable a safe tension, no matter how the seas may toss the vessels about. This cable is landed aboard the

wreck in the usual manner by shooting lines.

BATTLESHIP NORTH DAKOTA.

Two views are published herewith of the battleship North Dakota taken on Dec. 1 at the yard of the Fore Riv-

engaged in active work thereon; and therefore, be it resolved,

First—that we earnestly urge upon Congress, now in session, the necessity of making adequate appropriation for the speedy construction and completion of this work, and recommend

Bayou, Brazos river, Trinity river, Neches river, Sabine river, Calcasieu river, Mermentau river, Vermilion river, Teche river and Atchafalaya river and its tributaries.

Fourth—It being a fact that the government dredgeboat is removing obstructions in the Guadeloupe river from Victoria to the mouth thereof, we recommend that when this work is finished by it it be urged to remove obstructions in the Guadeloupe river from Victoria, Tex., to Cuero, Tex., as far as practicable.

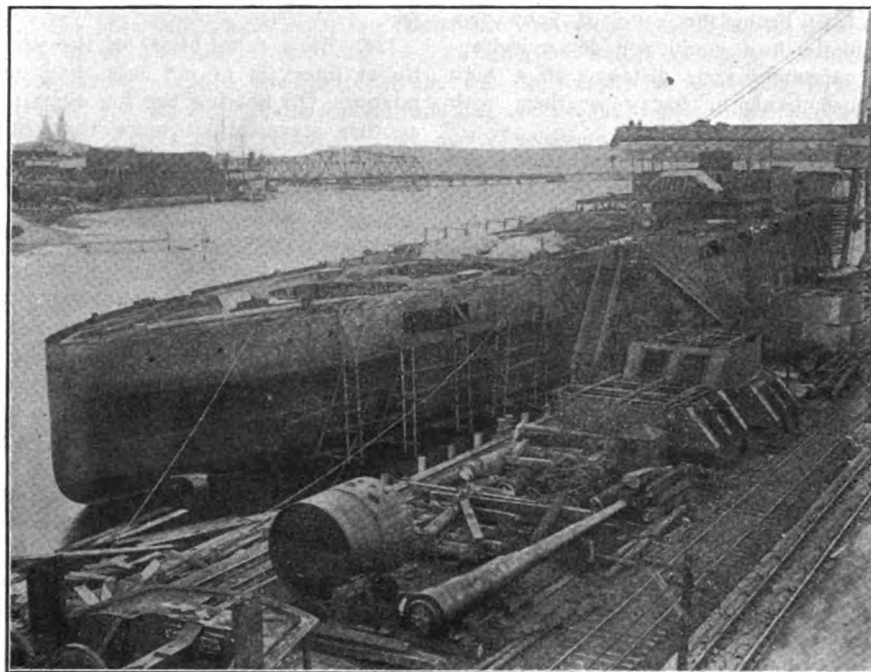
Fifth—That we indorse the demand of practically the entire country for a deep waterway from the lakes to the gulf, of which the intercoastal canal is a tributary.

Sixth—That we indorse the action of the National Rivers and Harbors Congress in asking the United States Congress to appropriate not less than \$50,000,000 annually for the improvement of rivers and harbors.

Seventh—That we recommend that the Congress of the United States and state legislatures pass laws applicable within their respective jurisdictions requiring that a railroad or railroads reducing freight rates to meet the competition of inland waterway transportation shall be required to make a proportionate reduction to all intermediate points.

Resolved, That the thanks of this convention be and are extended to the New Orleans Progressive Union and to the committee in charge of the Interstate Inland Waterways convention of the city of New Orleans and to the people of New Orleans for their cordial reception to the delegates attending such convention, and for their many and long-to-be-remembered courtesies.

Resolved, That the thanks of this convention are hereby tendered to Hon. C. S. Holland, president, and



PHOTOGRAPH OF THE BATTLESHIP NORTH DAKOTA TAKEN ON DEC. 1, SHOWING HER 62.8 PER CENT COMPLETED.

Building by the Fore River Ship Building Co., Quincy, Mass.

er Shipbuilding Co., showing the vessel 62.8 per cent. completed. It will be noted that the work of installing the belt armor has commenced. It is understood that the turrets have been ready for installation for some time but are held up by the non-delivery of armor to be furnished by the government.

INTERSTATE INLAND WATERWAYS LEAGUE.

At the fourth annual convention of the Interstate Inland Waterways League, held at New Orleans, Dec. 4 and 5, the following resolutions were adopted:

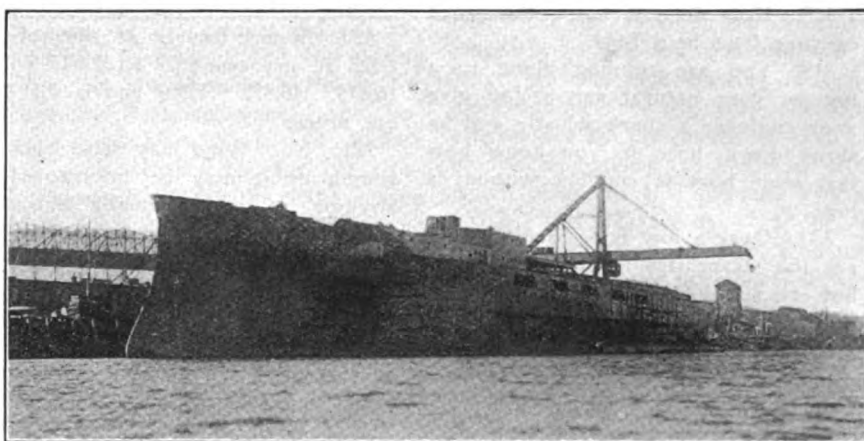
Whereas, it is essential to the commercial progress and material developments of the states of Louisiana and Texas that the intercoastal canal now being constructed from the Mississippi river at or near Donaldsonville to the mouth of the Rio Grande river should be constructed by the Federal government to a depth of not less than 9 ft. and a width of not less than 100 ft. at the bottom; and,

Whereas, the federal government has recognized the importance and feasibility of the construction of such a canal and appropriated money for its partial construction, and is now

that same be done under continued contracts.

Second—That we indorse the construction of a canal from the Mississippi river, opposite New Orleans, to Morgan City, La., as a necessary supplement to the present intercoastal canal route via Plaquemine Locks.

Third—That we indorse as meritorious the demands for improvement of the various tributaries which are to furnish tonnage for said inland canal as follows: Arroyo Colorado, Guadeloupe river, Colorado river, Buffalo



PHOTOGRAPH OF THE BATTLESHIP NORTH DAKOTA TAKEN ON DEC. 1, SHOWING HER 62.8 PER CENT COMPLETED.

Building by the Fore River Ship Building Co., Quincy, Mass.

Leon Locke, secretary, and their associates on the executive committee of the Interstate Inland Waterway League of Louisiana and Texas.

QUESTIONS FOR MASTERS AND MATES.—NO. 21.

310. You are on the course from Eagle Harbor to Whitefish Pt. The weather is thick and you figure that you are about 10 miles from Whitefish Pt., but you cannot hear the whistle. How would you verify your position by soundings? What soundings should you get if you were to the eastward of your course; what soundings and which kind of bottom should you get if you were to the westward of your course?

311. Can one depend upon the bearings taken of a fog whistle in a heavy fog? Why?

312. Having obtained the bearing of a fog whistle during a fog how would you verify your position?

313. In a fog Whitefish Pt. fog whistle bears due south from you and you figure that you are 4 miles off, how would you verify it? Supposing your patent sounding machine gave your depth at 38 fathoms, how far north of the point are you?

314. In approaching a fog signal from windward where could you pick up the whistle earliest, aloft or on deck?

315. Approaching a fog whistle from leeward, where could you pick it up earliest, on deck or aloft?

316. On the course from Pt. Betsey to Milwaukee in thick weather, how would you determine whether you were making good this course? How would you know if you were fetching westerly of the course? When would you begin to use the lead?

317. To give satisfactory results in the performance of this work, what instrument is necessary?

318. How do you know the speed of your boat in a fog?

319. You are running along in a fog on your natural gait. You give your engineer a check whistle and he slows down, how do you know how fast your boat is running without a log?

320. Over a low lying fog you can see the steam rise from a fog signal but can see nothing else. Fifteen-second intervals elapse from the time you see the steam till you get the sound of the whistle, how far are you from the whistle?

321. Can you judge your distance from a fog signal by the power of the sound? Why is it that many times

you can hear a fog whistle more distinct at a given distance away than at a given distance that is not so far away?

322. If you knew you were in range of the sound of a fog whistle and you could not hear it, what would you lay the cause to?

323. From the echo of your own whistle, how could you determine approximately your distance off a high shore bank in foggy weather, with little or no wind?

324. What extra precautions do you take in a fog in the navigation of your boat?

ANSWERS TO QUESTIONS FOR MASTERS AND MATES. NO. 21.

310. By taking chain of soundings and comparing them with the chart.

To eastward of course would get from 25 to 45 fathoms sand bottom. To westward and making in 11 to 7 fathoms, gravel and sand. Ten miles from Whitefish would be about N from Crisps Point and would get, if making in, soundings of 16 to 9 fathoms, making out 14 to 20, sand.

311. No. The sound may be influenced by air currents and reach one by a circuitous route. Sound may be reflected from a nearby hill, another vessel, or a heavy fog bank.

312. By the depth of water and quality of the bottom.

313. By the lead; 38 fathoms from 3 to 4½ miles N of the point.

314. Aloft.

315. On deck.

316. By taking soundings when about 15 miles from Milwaukee on the Pt. Betsey course, should get 41 to 50 fathoms, blue clay. If making to the westward, 35, 30, 20, 19, 13, as you get closer inshore.

317. A good sounding machine.

318. By the log, or the engine revolutions.

319. Figure it out by proportion according to the engine revolutions.

320. Sound travels at the rate of 1,125 ft. per second. $1,125 \times 15$ equals 16,875. $16,875 \div 5,280$ equals 3.1 statute miles.

321. No. Wind may drive back the sound, or it may be intercepted by streams of air unequally saturated with moisture. The sound may be weakened by repeated reflections, an air current may carry it over the heads of persons near the signal and convey it to the hearing of persons at a greater distance. It is not to be relied upon.

322. Wind, areas of silence, or other atmospheric conditions that might render the sound inaudible.

323. Take the time in seconds between the sound of the whistle and the echo and multiply by 1,125 and divide the result by two; the sound has to travel there and back. This is a very uncertain method, as the sound might be reflected from a fog bank, another vessel, or other nearby object.

324. Blow three blasts of the whistle at intervals of not less than one minute. On hearing the fog signal of another steamer not more than four points from right ahead, reduce speed to bare steerage way as required by law, keep additional lookout and in all respects navigate with caution. On approaching the shore or a turning point, use the lead at frequent intervals.

THE TRADE WINDS.

Most people have heard of the "Trade Winds," or simply "The Trades," as they are called by sailors, but it is probably not generally known what causes these winds and where they are found.

It is easy to understand that a wind that is steady in force and constant in direction is of great benefit to sailing vessels, and it is from this advantage to navigators—and hence to trade—that the trade winds take their name.

These winds are permanent over both the water and the land, prevailing in, and often beyond, the torrid zone. As the air within this zone receives a greater amount of heat than the air outside, it rises, and its place is supplied by the cooler air which rushes in from the tropics.

If the earth were at rest, it is evident that a north wind would blow in the northern half of the torrid zone, and a south wind in the southern half. But the earth, instead of being at rest, rotates on its axis from west to east. A little reflection will enable any one to understand that the greatest velocity resulting from this rotation must be found at the equator, and that as one recedes from the equator, the velocity diminishes until it reaches the poles, where it is nothing.

The wind which is rushing to the equator has continually a less velocity than that of the surface over which it passes, and so falls behind more and more as the equator is approached. This gives it a direction opposite to the earth's rotation, in other words, a direction from the east to the west, which, combined with the motion from the north and south, before mentioned, gives as a result

the northeast trades in the northern hemisphere, and the southeast trades in the southern hemisphere.

The trade winds then may be considered to be caused jointly by the rotation of the earth on its axis, and the movement of the air toward the equatorial regions, to take the place of the other air which has risen from the effect of heat.

Speaking roughly, the limits of the trades are 30 degrees north latitude and 30 degrees south latitude, between the two being a band of calms and light variable airs. This belt is called "The Doldrums," probably from the old Spanish word *dolorsa*, signifying tormenting, which a region of calms undoubtedly is to a sailing ship. The doldrums are the meeting ground of the northeast and southeast trades, and at this meeting point they have a neutralizing effect on each other. Here rains are frequent and very heavy.

The limits of the trades are continually changing, varying with the season of the year. Following the motion of the sun in the heavens, in the summer they extend probably 200 or 300 miles further toward the north and in winter they recede toward the south. It will be understood from this that the belt of equatorial calms is variable in position as it is also in width. In spring its center is found about 100 miles north of the equator, while in summer it extends 500 miles higher in latitude. Its width is ordinarily 300 miles, but at times it is thrice as wide, and then again there is occasionally no dividing line between the trades, and vessels are fortunate enough to run directly from one into the other.

To come now from the trades in general to the trades of the Atlantic. These have been known for centuries. Columbus probably noted the northeast trades on his first voyage of discovery. When not interrupted by hurricanes, which are uncommon, except in August, September and October, this northeast trade wind region is a veritable summer sea, so much so, indeed, that it was called "The Lady's Gulf" by the old Spanish navigators. It extends from the doldrums to the Horse latitudes, which is a belt of calms and variable winds from between 30 degrees and 35 degrees north latitude, according to the season of the year, and takes its peculiar name from the fact that in early days ships engaged in carrying cargoes of horses from Europe to the West Indies frequently found it necessary to

throw them overboard, owing to the frequent changes, rains, thunders, lightning, puffs and calms following each other in rapid succession in this perplexing region.

But the northeast and southeast trades of the south Atlantic blow over a wider extent on the African than on the American side, but, on the other hand, the doldrums are much broader on the eastern side, making it a part of the ocean to be avoided if possible.

The southeast trades are much stronger and more constant than the northeast, which are, in fact, somewhat capricious, frequently showing breaks in their regularity, which is hard to account for.

The trade wind regions are a delight to the mariner. Fogs are rarely experienced and gales rarely occur. The weather is pleasant, and the air dry. The wind being constant, the captain and officers have very little anxiety, and the sailors still less, of the usual monotonous work of setting and taking in sail, reefing and bracing yards. In fact, vessels some times "run down the trades" under all sail, and for days at a time there is no necessity of touching a rope.

SMALL CANAL TRAFFIC.

Statistics collated by Superintendent of Public Works F. C. Stevens show that the tonnage on the New York state canals for the season of 1908 was the smallest known for years, amounting on all canals to 3,051,877 tons, as against 3,407,914 tons last year. The department of public works attributes the falling off largely to the trouble which arose among the boatmen, the Erie Boatmen's Union, before the season opened having established an arbitrary rate of 5 cents per bushel on wheat between Buffalo and New York, refusing to make any concessions. As a result a large number of the union boats were idle a greater portion of the season, but some of the owners did not observe the agreement and by cutting prices did considerable business.

Leading boatmen, agents and forwarders of New York and Buffalo have declared that but for the troubles between the boatmen the season would have been one of the most prosperous that boatmen have known for many years. As it was, the railroads profited.

Capt. A. A. Moore denies that the foreign missionary steamboat *Morning Star* has been sold to Warren Stetson for the Port Angeles-Seattle route, as has been currently reported.

COMPASS ADJUSTMENT OF BULK FREIGHTERS ON THE GREAT LAKES.

BY FRANK HENRICH, COMPASS ADJUSTER.
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It appears without further investigation that for the bulk freighter on the great lakes there exists three conditions, every one of which will cause an aberration, with consequent change of deviation in the compasses of these steamers, they are:

When loaded with iron ore, iron, or other magnetic cargoes.

When loaded with coal, grain, or other non-magnetic cargoes.

When without cargo.

It follows that to ascertain what courses should be steered by compass, a steamer after adjustment, must be swung for deviations, under all the above mentioned conditions. From the tables of deviations so acquired, any change in the compasses, except for sub-permanent and transient magnetism, can be predicted, and a change in the adjustment made, if found necessary.

Without this complete method of adjustment, the navigator from the start is placed at a disadvantage, which constitutes a serious danger to the safety of the ship.

The changes in the compasses between a load of iron ore and non-magnetic cargoes being small, this paper will be devoted to the difference in deviation between loaded and light, they are decidedly larger in certain types of steamers, and depend:

1. On the length of the ship.
2. On the accuracy with which the initial adjustment is made.
3. Upon the favorable placing of the compasses and absence of disturbing influences in their vicinity.

Referring to (1) the length of the ship, it is evident that the longer ships have the smaller angle of pitch when light; let us assume four steamers, respectively 300, 400, 500 and 600 ft. length of keel, each drawing 16 ft. aft, and nothing forward, then the draft aft, divided by the length of keel will be the tangent of the angle of pitch, which gives for the different lengths: 600 ft. = $1^{\circ} 32'$, 500 ft. = $1^{\circ} 50'$, 400 ft. = $2^{\circ} 18'$, 300 ft. = $3^{\circ} 4'$, from this it follows that the difference between loaded and light is more noticeable in short than in long steamers. From swingings of numerous steamers it is found that on those over 500 ft. length, the error is small, and vanishes for practical purposes on ships approaching the length of 600 ft.,

providing conditions 2 and 3 are not violated.

In regard to (2) it appears that inaccurate, initial adjustment may produce appalling changes between the two conditions.

Farther, as to (3), unfavorable placing of the compasses, for instance, too close to the vertical bulkhead of the pilot house, or the existence of unsymmetrical iron in proximity of the compasses, may confound all that has been said on the subject. From personal observation and the statement of captains in ships where these conditions exist, a slight change in the amount of water carried in the tanks or hold, may result in an error of half a point or more on some courses.

It is also apparent that the maximum effect of this error is on the east and west headings, zero on the north and south points; in other words, it constitutes a heeling error in the fore and aft direction, it can be adjusted with the vertical magnet found in every modern binnacle directly underneath the compass.

To illustrate the above, I herewith furnish the tables of deviations, as found on the steamer Frank H. Peavey. The initial adjustment was made on the trip from Two Harbors to Buffalo, cargo iron ore, off Thunder Bay Island, Lake Huron, Oct. 10, 1908; swung for final deviations on the same trip off Long Point, Lake Erie, Oct. 12, 1908; also swung when light off Ashtabula, Oct. 14, 1908. The Peavey is a steamer 430 ft. long, 50 ft. beam, 27 ft. deep, steel pilot house, with wooden top and shelter rail; the outfit consists of a compensating binnacle and compass of the Bliss type, both for standard and steering compass, both binnacles being provided with a brass tube for the reception of a heeling error magnet, but the latter had been removed. The steering compass is rather close to the forward bulkhead of the pilot house; as usual in lake steamers, the steel foremast is abaft the compasses, iron is symmetrically distributed, except the steam capstan and vertical spindle, which set about 14 in. to starboard.

While swinging for deviations, Capt. Duncanson attended the steering compass, Mr. Nesbit, chief mate, the standard, the writer gave the magnetic headings, as the ship passes each full point, the ship describing a complete circle. Both, under starboard and port helm, the deviation here given is the mean of the two, for every

other point on account of space, and is expressed in degrees and tenths:

Ship's Head Magnetic.	Standard Compass —Deviation—		Steering Compass —Deviation—	
	Loaded.	Light.	Loaded.	Light.
N.	+1.4	+1.4	0	+2.0
N. N. E.	+1.4	+1.4	0	0
N. E.	0	+1.4	-.7	0
E. N. E.	0	+2.8	-.7	+ .7
E.	0	+5.6	-1.4	-.7
E. S. E.	0	+5.6	-4.0	-1.4
S. E.	+1.4	+7.0	-2.0	-.7
S. S. E.	+ .7	+5.6	-.7	-1.4
S.	0	+5.6	-.7	+2.0
S. S. W.	0	+2.8	0	+2.8
S. W.	0	+1.4	+ .7	+4.8
W. S. W.	0	-2.8	+1.4	+3.5
W.	0	-3.5	+1.4	+3.5
W. N. W.	0	-3.5	+1.4	+2.0
N. W.	+1.4	-2.8	+1.4	+2.8
N. N. W.	+1.4	-1.4	+ .7	+2.8

The + sign designates easterly, the — sign westerly deviation.

These are the facts. I have the original deviation cards in the handwriting of the officers, who were kind enough, for their own benefit and the advancement of science, to make the observations. I have also some 50 others from different steamers, and selected these because the length of the steamer is suitable for revealing the error.

The computation of the co-efficients from the deviations observed furnish the most important data for future reference; they do not interest the navigator, but are of great value to the adjuster, graphically illustrating the changes in the co-efficients.

HOW JAPAN HELPS HER INDUSTRIES.

It is the opinion of Henry B. Miller, American consul general at Yokohama, who is at present visiting on the Pacific coast, that Japan is a very formidable rival of the United States for the commerce of the countries bordering upon the Pacific ocean. Mr. Miller states that there is no important industry of Japan but is aided and developed largely by the government, and any country which is anxious to work up a trade with Oriental countries would do well to study the political economy of Japan.

Mr. Miller states that "through the control of the finances of Japan, the railroads and steamship lines and the power to arrange subsidies, tariffs and rebates in any way best suited to its purpose, the 50,000,000 people of Japan may be concentrated behind any one industry or activity by the government.

"The great steamship companies of Japan have the largest per cent of their capital stock owned by the imperial household. The government owns the control of the Bank of Japan and the Yokohama specie bank, and through these institutions manages to control the whole financial

system. This imperial treasury is to some extent a part of the government. By investing in the leading enterprises the government encourages every project of consequence to the country.

"Through the control of the finances a certain amount of money for the encouragement of the various industries is set aside by the government, and this fund amounts to a large sum. The silk and tea industries are encouraged in this way and the marketing of products is also helped. Cotton goods are marketed by forming a trust of the manufacturers under the direction of the Mitsui Co., whereby the diversified products of the various factories are changed into standard goods fitted especially for the markets of China and are carried to market by the Mitsui Co. The government furnishes money to manufacturers at 4 per cent interest to extend this trade.

"The investment of the imperial household in the various industries insures whatever aid is needed to build them up. Favorable tariff schedules are arranged, rebates and cheap transportation. The government has a monopoly of the railroads, salt, tobacco and camphor. It has inaugurated the lumber and other industries where individuals had not the capital or courage to develop them.

"While our trade with Japan is constantly on the increase, yet there ought to be a careful examination of the trade between the two countries and a tariff to meet the conditions ought to result in largely increased exports to that country. The new Japanese tariff will go into effect in 1911. The government has experts engaged in studying conditions in all countries to enable the establishment of a new tariff, especially in line with the necessary benefits to her industries and commerce.

"The industrial development of Japan has been marked during recent years. The United States now consumes one-third of the exports of Japan."

The Heffernan Dry Dock Co., Seattle, Wash., is installing oil-burning apparatus in the steamers Hyades and Pleiades, owned by the Boston Towboat Co., and recently chartered to the Matson Navigation Co. and the American-Hawaiian Steamship Line respectively. It is reported that the Pleiades will also undergo some changes to her machinery to enable her to make greater speed.

ANNUAL REPORT LIFE-SAVING SERVICE.

General Superintendent Kimball of the life-saving service has transmitted to the secretary of the treasury the report of the operations of his bureau for the year ending June 30, 1908.

The report states that at the close of the fiscal year the life-saving establishment comprised 280 stations, embraced within 13 districts, and distributed by coasts as follows: 201 on the Atlantic and Gulf coasts, 61 on the coasts of the great lakes, one at the Falls of the Ohio (Louisville, Ky.), and 18 on the Pacific coast.

The number of disasters to documented vessels within the field of station operations during the year was 386. There were on board these vessels 3,749 persons, of whom 16 were lost. The estimated value of the vessels was \$9,776,725, and that of their cargoes \$3,135,190, making the total value of property endangered in connection with casualties to documented vessels \$12,911,915. Of this amount \$11,056,805 was saved and \$1,855,110 lost.

There also occurred within the year 708 casualties to undocumented craft—sailboats, launches, rowboats, etc.,—carrying 1,963 persons, of whom six were lost. The value of the property involved in these instances was \$618,310, of which \$609,630 was saved and \$8,680 lost.

The life-saving crews succored at the stations 562 victims of shipwreck and of boating accidents, a total of 1,000 days' relief being furnished.

The results of disasters to vessels of all classes within the scope of the service are shown in the following table:

Number of disasters.....	1,094
Number of vessels totally lost	56
Number of persons involved	5,712
Number of persons lost....	22
Number of persons succored at stations	562
Number of days' succor afforded	1,000
Value of vessels involved..	\$10,390,955
Value of cargoes	3,139,270
Total value of property involved	13,530,225
Value of property saved...	11,666,435
Value of property lost....	1,863,790

Of the 1,094 vessels included in the foregoing tabular statement, the life-savers rendered assistance to 1,053, valued with their cargoes at \$12,557,170. Aid of more or less importance was also extended to 89 documented and 210 undocumented vessels not included in the table, making a grand

total of 1,352 vessels receiving assistance from the station crews. In addition 97 steamers, and 122 vessels of other classes, running into danger, were warned of their peril by the signals of the patrol and the tower watchmen in time to escape disaster; 199 of these warnings being given at night and 20 during the day in thick weather. Lives and property were undoubtedly saved in numerous instances by these warnings, but it is of course impossible to estimate in figures the value of this feature of the service.

While it is primarily the province of the service to save and succor the shipwrecked, a considerable number of persons not connected with vessels are annually rescued from various situations involving imminent peril of their lives. There were 56 cases of this character during the year. Fifty-one of the 56 persons involved were in danger of drowning. Of these, 26 had fallen into the water from piers, boats, etc., 13 were imperiled bathers and swimmers, three had drifted out to sea, two were cut off from land by the rising tide, three were in a building that had been undermined by the sea, and four were adrift on the ice. Of the five persons remaining, one had attempted suicide, one (an intoxicated man) was taken from a snowdrift, two were found helpless on the beach suffering from exposure, and one (a child) was discovered hanging head downwards with one of its feet fast in a fence. Fifty persons received medical and surgical attention at the hands of the station crews. Private property was retrieved and restored to the owners in 92 instances. Included in the list of things recovered are upwards of three dozen fish nets, nearly the same number of domestic animals, five runaway teams, a large quantity of lumber, a bicycle, a load of hay, two automobiles, and a balloon.

A very important share of the miscellaneous work of the life-savers is that classified under "assistance at fires." Thirty-five of such instances of service occurred during the year, involving 25 dwellings, two lighthouse structures, one store building, two grain elevators, one mill, three hotels, one wireless telegraph station, one church, three bath houses, two barns, a warehouse, a clubhouse, and a freight house. The station crews also helped to put out eight grass and forest fires.

On 58 occasions the men of the service rendered substantial assistance to other branches of the government in the performance of such work as locating, reporting and mark-

ing wrecks, taking soundings, setting and recovering buoys, reporting buoys adrift, marking channels, bringing United States mail ashore from vessels, etc., etc.

The expenditure for the maintenance of the service during the year amounted to \$1,962,524.90.

The general superintendent reports a gratifying improvement in the condition of the service, brought about by act of Congress approved March 26, 1908, increasing the compensation of life-saving crews. Previous to the enactment of the law mentioned the men of the service were leaving the stations in large numbers because they could command more pay in less hazardous employment. The legislation referred to has happily operated to check this exodus, and made it less a problem to keep the crews filled with capable surfmen. The new law does not, however, in the opinion of the general superintendent, entirely meet the needs of the service, in that it makes no provision for the veteran surfmen in the way of retirement pay.

SHAWMUT AND TREMONT SOLD.

The steamers Shawmut and Tremont, now at the Puget Sound navy yard, have been purchased by the Isthmian canal commission of the Boston Steamship Co. to be used for transporting coal to the Panama canal. It is understood that the sum paid for these two steamers was \$1,157,301, which is considerably less than the builders' price. These steamers were built by the Maryland Steel Co. at Sparrow's Point, in 1902, for the Boston Steamship Co. and placed in the over-sea trade on the Pacific ocean. It was thought at that time that congress would enact legislation removing some of the handicaps now obtaining against the operation of American ships in the foreign trade, and it was in anticipation of such a measure that the Boston Steamship Co. courageously built the steamers and put them into commission. The failure of congress to help the American ship caused the venture to end disastrously. After an heroic struggle against the subsidized lines of Japan the steamers were withdrawn and placed in ordinary. The steamers are splendid types of ocean-going freighters.

The new 35-ft. channel from Baltimore to the Capes of Virginia, which is 600 ft. in width, is almost completed and will be available to vessels of the largest draught before the end of the month.



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**SECRETARY STRAUS ON SHIP-
PING.**

Secretary Straus of the Department of Commerce and Labor, in his annual report just sent to the President, renews the recommendation made in his last annual report in favor of a measure that will insure superior mail communication with the republics of South America, with Australasia by way of our insular territory in the Mid-Pacific, and with the Philippines by way of China and Japan. A bill which in its essentials accords with that recommendation has passed the Senate and now awaits action by the House. Continuing he said:

"The Department of Commerce and Labor has a three-fold interest in the improvement of our ocean-mail service. It is concerned in the development of American ocean-mail steamship lines, especially to South America and on the Pacific, because such steamships afford the opportunities for buyers and sellers to travel to and

from this country, for the speedy and regular transmission of mail orders, and for the transportation of classes of manufactured goods for which especially we seek markets. Under modern conditions of international competition such opportunities must be made satisfactory, if our producers, both capitalists and laboring men, are to have a fair chance with those of other nations in the relatively new markets of the world. That such opportunities are not now satisfactory is shown by an unbroken line of undisputed testimony of competent witnesses.

It is not now possible to travel with satisfactory speed and comfort from the United States to many South American countries or to Australasia unless the voyage is made by way of European or Canadian ports. Perhaps in time foreign steamship lines may find it to their profit to improve present conditions, but our reliance upon such foreign lines is already so great as to impair that independence on the sea which ought to be the aim of a country holding the present rank of the United States among nations. Since the adjournment of Congress the American battleship fleet has sailed nearly around the world on a mission of peace. The attending fleet of foreign colliers has been evidence to all the world that this voyage would have been well-nigh impossible in time of war, and that during hostilities the radius of action of our battle ships will be practically restricted to their limited coal-carrying capacity so long as our merchant marine on the sea remains dwarfed.

"An ocean-mail act will not, of course, lead directly to the construction of colliers. In the development of modern shipping corporations, however, the cargo steamer has usually followed the faster ocean-mail steamer. Such has been our experience under the ocean-mail act of 1891, in so far as its rates of compensation have sufficed to produce results, and such doubtless will be the effect of a satisfactory amendment to that act. The construction of such cargo steamers will still further increase our ocean transportation facilities for the benefit of the

interior productive fields of the United States.

"Again, the cost of construction of ships is the initial, though not the sole, obstacle in the way of the development of the American merchant marine in over-sea trade. Our extensive program of naval construction and our coastwise trade law have created our modern shipyards on the seaboard, but it is not to be expected that they will always suffice to maintain them. The transportation of ocean mails is as legitimate a function of government as the transportation of domestic mails. As such the ocean-mail service seems to me to be entitled to the support of the entire Congress, regardless of the general economic theories which may be held by individual members. If such support shall involve indirectly the increase of our fleet of cargo-carrying ocean steamers and the upbuilding of domestic shipyards, then the gain to the whole country is the greater.

"Congress in 1891 appreciated the importance of an American ocean-mail service. The act of that year has since stood free from successful criticism of its principle and purpose. It has produced results in certain directions and it has failed in other directions, where failure was foreseen by its advocates. We stopped with that act, while other nations have advanced. We should bring that legislation abreast of the day. In my report last year I stated:

"For many years it was entirely true that the energies of the country were so absorbed in its internal development that there was no surplus to devote to expansion of national trade and influence outside our coast lines. It is equally true that such is no longer the fact. The acquisition of insular territory, the construction of a powerful navy, and the investment of American capital abroad are all tokens of a tendency in national growth which will compel our country to become again a sea power, as it was when the Republic was only a fringe of states along the Atlantic seaboard."

"Even under favorable conditions at least two years and possibly three

years must elapse before the American ocean-mail lines to South America south of the Carribean can be established and a line to Australasia re-established. Accordingly, I earnestly recommend the passage by the House of Representatives of the ocean-mail bill which has already passed the Senate.

"We ought to provide better facilities for passengers between Hawaii and the mainland of the United States. It would be preferable to use American steamships for the purpose, and the passage of the ocean-mail bill recommended would bring about that result. Pending the establishment of such American mail lines our coasting laws in this particular could very properly be modified as proposed in a bill which has passed the House and is now on the Senate Calendar."

STEAMER THEODORE H. WICKWIRE LAUNCHED.

The bulk freighter Theodore H. Wickwire, building for the American Steamship Co. of Buffalo, was launched from the Ecorse yard of the Great



MR. THEODORE H. WICKWIRE.

Lakes Engineering Works on Saturday last and was christened by Miss Adda Cornelius, sister of Adam Cornelius, of the firm of Boland & Cornelius, who will manage the new ship. The new steamer will carry ore to the new furnaces of the Wickwire Steel Co. that are now being built on the Niagara river. The new steamer is 464 ft. over all, 444 ft. keel, 56 ft. beam and 28 ft. deep.

PIG IRON SITUATION.

Despite the usual holiday dullness, the market is not weak at any point. A considerable falling off in specifications on steel products has been noted since the tariff controversy became animated. The starting of one blast furnace at the new plant at Gary, Ind., marks the beginning of manufacturing at that new industrial center. Comparison of the year's business in structural material discloses some interesting statistics; the American Bridge Co. delivered about 350,000 tons and independent interests about 800,000 tons of material. About 35,000 tons of basic pig iron have been sold in the eastern territory the past week and there are very fair sized inquiries out for foundry iron. The trade, generally speaking, is quiet but firm. Railroads are still ordering steel cars, box cars and underframes, and considerable steel car business is under negotiation, with the likelihood of being placed early in the year. Tin plate specifications were the heaviest the past week of any week since the summer of 1907. The scrap market is showing some signs of weakness, although quotations in only a few cases are lower.

ORE SHIPMENTS FOR 1908.

The final shipment of ore for the season of 1908 was taken by the steamer W. D. Rees from Escanaba to Milwaukee, consisting of 5,349 tons. December shipments were therefore 78,924 tons, and the total movement for the year 25,427,024 tons. Shipments for the past three years by ports have been as follows:

Port.	Dec. 1906.	Dec. 1907.	Dec. 1908.
Escanaba	134,778	39,572	19,272
Marquette	47,814	4,466	19,305
Ashland	54,551	14,396	14,707
Superior	103,679	13,204	25,640
Duluth	122,043	.....	.....
Two Harbors	77,729	19,179	.....
Total	540,594	90,817	78,924

Port.	Season 1906.	Season 1907.	Season 1908.
Escanaba	5,851,050	5,761,988	3,351,502
Marquette	2,791,033	3,013,826	1,487,487
Ashland	3,388,112	3,437,672	2,513,670
Superior	6,083,057	7,440,386	3,564,030
Duluth	11,220,218	13,445,977	8,808,168
Two Harbors	8,180,125	8,188,906	5,702,237
Total	37,513,595	41,288,755	25,427,094

GILCHRIST TRANSPORTATION CO. REORGANIZED.

The Gilchrist Transportation Co. has been reorganized. All the old officers and directors, including J. C. Gilchrist, its president, have resigned. For some months past Mr. Gilchrist has been unable, owing to ill health, to give any attention to the business,

which has been managed by a committee. At a meeting of the stockholders last week it was decided to reduce the board of directors from 11 to five members, and the following were accordingly elected. F. M. Osborne, president of the Youghioghney & Ohio Coal Co.; Gen. G. A. Garretson, president of the Bank of Commerce National Association; H. P. McIntosh, president of the Guardian Trust Co.; James C. Wallace, president of the American Ship Building Co.; and Frank W. Gilchrist, of Alpena, Mich.

The directors elected F. M. Osborne president and C. L. Mosher secretary and treasurer. Mr. Mosher is the vice president of the Guardian Trust Co.

Mr. Mosher announced that the floating debt of the company had been taken care of some months ago and that the company is in good shape. With the exception of the Pittsburg Steamship Co., the Gilchrist Transportation Co. controls more vessels than any steamship company on the lakes. Its fleet consists of 60 boats, 32 steel steamers, 25 wooden steamers, two steel barges and one wooden barge. Many of these vessels were owned by individuals, but were consolidated about eight years ago and the company since that time has made it a practice to add a few steel steamers to the fleet each year.

A manager for the fleet has not yet been selected, though it is understood the place has been offered to Silas Hitchcock.

STEAMSHIP BONDS IN DEMAND.

Steamship bonds on bulk freighters of the great lakes are in great demand as a security, nearly all the issues on existing steamers having now been disposed of. The Cleveland Trust Co. during the year has floated over \$3,000,000 worth of these bonds. In fact, it is now buying back these bonds, whenever it can, at the price at which it sold them. The bonds have been selling at somewhat less than par and net the purchaser about 6 per cent.

The Susquehanna Coal Co., 1305 Old Colony building, Chicago, Ill., has just issued a memorandum book for 1909 which will be found especially serviceable. The book has a number of excellent conversion tables including conversion of gross into net tons that will be found very valuable.

BUFFALO'S GRAIN FLEET.

Buffalo, Dec. 22.—By far the biggest winter storage fleet ever seen in Buffalo or anywhere else is now all laid up at the breakwater in the outer harbor, except that a few of the smaller cargoes managed to find room inside. This fleet is composed of 54 vessels, all steamers but one or two and they carry 15,523,500 bushels of grain and flaxseed, of which 9,700,000 bushels is wheat, practically all of it high grade, 4,500,000 bushels is flaxseed, there is a trifle over 1,000,000 bushels of oats, of which the steamer J. J. Boland alone has 482,000 bushels, and there is a little barley and rye. Corn, being more perishable than other grains and not usually well dried at this time of the year, not being represented in the list.

Buffalo is very proud of this list of course and it may never see the like again, for it has never seen more than about two-thirds of the amount before, so that the exceptionally bad lake season has managed to wind up with a bang, at least so far as this port is concerned. Capt. J. J. H. Brown, in speaking of this fleet, said that the grain is worth practically a dollar a bushel and that the vessels carrying it are worth just about as much as the grain is, so he is quite willing that the world should know that this port has \$30,000,000 worth of property tied up here in this way and that it has the facilities for handling it and taking care of it easily.

These vessels are not all owned here, though Buffalo has been gaining very fast lately in its tonnage of large size and there are about a dozen in this fleet controlled here and in Tonawanda, one remarkable thing in connection being that every one of them is capable of carrying 400,000 bushels of wheat at a cargo. The reason why so much grain came down here late and has tied up afloat instead of being put into elevators is that a dispute over freights kept everything at a standstill until the very last moment, so that in the neighborhood of 20 of the cargoes arrived in a single day in December, and the fact that the vessels charge only $\frac{1}{2}$ cent for storage, where the elevators charge 2 cents, did the rest. But for late storms and other complications at the other end of the route there would have been considerable more December grain brought in.

The harbor elevators are having an easy time of it, in fact rather too easy in some regards, for outside of the

steel houses, they hardly got what winter storage they wanted, and the elevation was practically completed last week, the showing being about 7,000,000 bu. in elevator, some of which will be shipped out very soon. Grain sells pretty slowly and for this reason it is felt to be a good thing to have it here where it is costing the carrier but little and yet where it can be moved fast if trade should stiffen up during the winter.

The array of 400 and 500-ft. steamers headed up at the breakwater creates, it must be admitted, something of a feeling of apprehension as well as of pride on the part of people who have any interest in vessel, grain or insurance, as exposure to storm is greater than it would be in elevator, though the first risk is perhaps less. There has been one bad storm in the winter fleet here (Jan. 20, 1907), but this is the best that can be done with it until the Niagara ship canal is finished, when a better laying up frontage ought to be afforded.

It is a source of disappointment to the vessel owner that the corn traffic has almost all been absorbed by the railroads lately. But for the fact that corn freights by rail are now so low that this grain almost all oozes out before the lakes open in the spring, or the great cargoes are so damaging to the grain that it seldom comes by lake even then, the marine handling of grain here would be as much again in a season as it is now. But with more than 100 cars by rail of corn being reported daily to our grain inspectors and perhaps more than that amount coming here that is not inspected, the lakes must depend upon flaxseed and other grain for most that they carry in that line.

Buffalo is the great eastern malting center of the country, having converted usually about 10,000,000 bu. of barley annually in that trade lately, and yet it is found that there is only about 250,000 bu. of barley in the winter fleet, which means that the Buffalo maltsters are pretty well provided with elevators of their own and are moreover not a little afraid of the trade this year on account of prohibition agitation, so that they have not laid in the stock that they otherwise would have done.

JOHN W. CHAMBERLIN.

AROUND THE GREAT LAKES.

The tug American Eagle was burned to the water's edge at Toledo on Monday morning, Dec. 21. Fire broke out while the tug was steaming down the river and spread with great rapidity. The crew were res-

cued with some difficulty by the steamer Sheboygan, which happened to be there. The American Eagle operated for years as an ice breaker and mail boat between Sandusky, Put-in-Bay and the Islands. She was owned by the Great Lakes Towing Co.

The Chandler-Dunbar Co. has accepted the offer of \$250,000 for the land needed for the government locks at the Sault.

The Grace Harbor Lumber Co. has purchased the lumber carrying steamer Toltec from the Marine Transit Co., Marine City, Mich., for \$22,500.

The recommendation of Major W. V. Judson for the re-establishment of the North Point light in Milwaukee harbor has been approved by the lighthouse board.

Wm. C. Campbell, for 12 years connected with the Baltimore & Ohio dock office at Lorain, has been appointed Lorain manager for the Great Lakes Towing Co.

Capt. Murray G. McIntosh, of Detroit, will sail the steamer John A. Barlum, now building at Lorain for the Postal Steamship Co. Clarence O'Connor will be her chief engineer.

The office of the Canada Atlantic Transit Co. and the Ontario Car Ferry Co., Ltd., have been removed from the Board of Trade building to the Canadian Express building, 95 Magill street, Montreal.

The tug Essayons, built by the Racine Boat Mfg. Co. for the government engineer at Duluth, was supplied with Webb perfection galley ranges by Elisha Webb & Sons Co., Philadelphia, Pa.

The Canadian steamer Collingwood, which cleared from Fort William Dec. 10, discharged her cargo of 250,000 bu. of wheat at Midland. The steamer was paid 5 cents a bushel, or \$12,500, which was the highest rate obtained by any Canadian or American tonnage in the season of 1908.

Lieut. Col. John Millis, government engineer at Cleveland, will hold a public hearing next Tuesday in the matter of establishing harbor lines from the foot of East Ninth street to Gordon Park. All interested are invited to attend and those desiring to do so are requested to present their views in writing.

The national officers of the Marine Engineers' Beneficial Association met in Cleveland this week to discuss the form of individual contract now being entered into between the engineers and some of the vessel owners. The Pittsburg Steamship Co. has made individual contracts with its en-

gineers for the past year. The particular feature of the contract that the national officers do not like is that which calls for co-operation in carrying out the plans of the Lake Carriers' Association upon an open shop basis. The officers who were in Cleveland were Wm. F. Yates, of New York, national president; A. L. Jones, of Detroit, national treasurer; W. D. Blaicher, of Buffalo, member of the advisory board, and W. P. Tindall, of Detroit, lake business manager. Undoubtedly this form of contract will be discussed at a general meeting of the lake lodges before the national meeting of the association is held in Washington next month.

COMMERCE OF LAKE SUPERIOR.

The statement of lake commerce through the canals of Sault Ste. Marie for the season of 1908 has just been issued by Lieut. Col. C. McD. Townsend and for purposes of comparison the commerce of 1907 is also given. The total commerce for 1908 was 44,087,974 tons against 58,217,214 tons for 1907, a decrease of 29 per cent. Following is the table:

ITEMS—	Total Traffic—		Change—	
	Season 1907.	Season 1908.	Amount.	Per cent.
Vessels—				
Steamers, number	17,245	12,553	4,692	—27
Sailing, number	2,303	1,355	948	—41
Unregistered, number	889	1,273	384	43
Total, number	20,437	15,181	5,256	—26
Lockages, number	14,020	10,685	3,335	—24
Tonnage—				
Registered, net	44,087,974	31,091,730	12,996,244	—29
Freight, net	58,217,214	41,390,557	16,826,657	—29
Passengers, number	62,758	53,287	9,471	—15
Coal—				
Hard, net tons	1,506,668	1,384,743	121,925	—8
Soft, net tons	9,893,427	8,517,717	1,375,710	—14
Flour, barrels	6,524,770	5,704,375	820,395	—13
Wheat, bushels	98,135,775	106,041,873	7,906,098	8
Grain, bushels	43,463,338	43,458,583	4,755	..
Manufactured and pig iron, net tons	307,941	289,308	18,633	—6
Salt, barrels	460,802	547,223	86,421	19
Copper, net tons	89,959	101,735	11,776	13
Iron ore, net tons	39,594,944	24,650,340	14,944,604	—38
Lumber, M. ft. B. M.	649,320	453,761	195,559	—30
Building stone, net tons	898	1,019	121	13
General merchandise, net tons	1,022,654	842,901	179,753	—18

The United States canal was opened April 27, and closed Dec. 13, 1908; season, 231 days.

The Canadian canal was opened April 21, and closed Dec. 15, 1908; season, 239 days.

UPSON-WALTON BLOCK CATALOG.

The fourth of a series of catalogs which the Upson-Walton Co. is now issuing has just come from the press. It is on tackle blocks and sheaves and follows the style maintained in the other catalogs. The Upson-Walton Co. have built up an enviable reputation on its blocks. For the Cleveland block it claims that it is unex-

celled by anything on the market. The catalog describes the blocks in detail, giving all information as to sizes and prices that any customer would like to know. It will be sent to any one interested upon request.

CHICAGO GRAIN SHIPMENTS.

George F. Stone, secretary of the board of trade of Chicago, has compiled the shipment of flour and grain eastward by lake from Chicago for the season of 1908, as follows:

Ports to which consigned.	Flour, bbl.	Wheat, bu.	Corn, bu.	Oats, bu.	Rye, bu.	Barley, bu.
Buffalo	2,493,795	6,733,246	13,939,757	3,108,025	45,020	182,000
Erie	608,700	190,000	52,000	.....	.....	20,000
Ogdensburg	51,170	259,000	3,398,272	116,600	.....	.....
Port Huron	.....	.....	821,468	644,800	.....	.....
Fairport	269,650	.....	.....	.....	.....	.....
Other United States ports	.....	.....	465,998	546,000	.....	.....
Depot Harbor	47,200	1,085,666	559,890	.....	5,000	.....
Montreal	.....	1,314,750	.....	.....	31,800	.....
Midland	1,000	544,125	810,252	.....	.....	.....
Collingwood	.....	.....	1,338,016	.....	.....	.....
Kingston	.....	279,000	566,813	.....	.....	.....
Other Canadian ports	.....	.....	1,762,409	.....	.....	.....
Total	3,471,515	10,405,787	23,714,875	4,415,425	101,820	202,000

DUTY ON FOREIGN-BUILT YACHTS.

Judge L. E. Payson, counsel for the Newport News Ship Building & Dry

but their entire equipment and furnishing of rich cabinet work, upholstering, china and silverware, and even the uniforms of their officers and men, are brought in free of duty, although the same articles are dutiable at a high figure if purchased by the owner of an American-built vessel. These foreign-built yachts do not receive an American registry, but sail under a certificate of American ownership and fly the American yacht ensign, so that they appear to be, to all intents and purposes, vessels of the United States. They enjoy an actual advantage, Judge Payson said, over American-built yachts, in that they are not subject to the pilotage and inspection laws and are not required to carry licensed officers. As a result, not one large sea-going steam yacht of American construction has been added to the New York yacht fleet in several years. The Vanderbilt yacht North Star, George J. Gould's Atalanta and Joseph Pulitzer's Liberty, Judge Payson asserted, are notable examples of the discriminations enforced by American law against American ship building, for all of these craft are foreign built, and no fewer than six large yachts have been procured from British builders by New York men within the last year, at an aggregate cost of from \$2,000,000 to \$3,000,000. It was stated by Judge Payson that these loopholes in the tariff were depriving 5,000 or 10,000 American workmen of employment and that the government was losing a large revenue on what was a luxury. Judge Payson believes that the committee will report the legislation desired.

Dock Co., appeared before the committee on ways and means last week and urged that the new tariff provide for a substantial duty on foreign-built yachts brought into this country by American citizens. Five years ago in a case brought by the collector of the port of New York against Frederick W. Vanderbilt, owner of the Conqueror, the supreme court decided that foreign-built ocean-going yachts were not dutiable as manufactures of iron, under the Dingley tariff. Since that time the art of building ocean-going steam yachts of large size has been practically dead in America. Other wealthy Americans, following the example of Mr. Van-

AVERAGE LAKE FREIGHT RATE.

There is appended herewith the usual annual summary of lake freight rates for the season of 1908. There is not much comfort to be derived from the contemplation of it. Practically every commodity save lumber was carried at a reduced rate. The ore rate, which had held firm for the past three years at 75 cents from the head of the lakes, 70 cents from Marquette and 60 cents from Escanaba, suffered a reduction of 10 cents from each of the ports. Every ton of ore moved was carried at this rate, no premiums being offered wild vessels during the fall months. Coal was moved to the head of the lakes for 30 cents, to Chicago at 40 cents with the customary differential of five cents to other Lake Michigan ports. These

1903.....	48	38
1904.....	43	34
1905.....	44	34
1906.....	46	35
1907.....	40	31
1908.....	40	30
Average for 10 years.....	47	36

Rate to Milwaukee practically the same as to Chicago.
Hard coal is net tons and is handled without charge to vessel.

AVERAGE OF DAILY RATES ON SOFT COAL FROM OHIO PORTS TO MILWAUKEE, ESCANABA, DULUTH, GREEN BAY AND MANITOWOC.

Year.	Mil- waukee. Cents.	Escan- aba. Cents.	Duluth. Cents.	Green Bay. Cents.	Mani- towoc. Cents.
1899.....	69	58	45½	66½	67
1900.....	45	40	40	45	43½
1901.....	49	46	38	48½	48
1902.....	46½	41½	34½	46½	42
1903.....	50½	45	41½	50½	46
1904.....	47	40	37	45½	47
1905.....	46½	41½	33½	42	41½
1906.....	46	42	35	42	42
1907.....	40	35	30	35	35
1908.....	40	35	30	35	35
Average for 10 years.....	48	42	36	45½	44

Chicago rate about same as Milwaukee.
Coal of all kinds shipped in net tons and handled without charge to vessel.

AVERAGE DAILY RATES OF FREIGHT ON THE GREAT LAKES.

	1906. Cents.	1907. Cents.	1908. Cents.
Iron ore, Escanaba to Ohio ports, gross ton.....	60.00	60.00	50.00
Iron ore, head of Lake Superior to Ohio ports, gross ton.....	75.55	75.00	65.00
Iron ore, Marquette to Ohio ports, gross ton.....	70.00	70.00	60.00
Wheat, Chicago to Buffalo, bu.....	1.7223	1.5795	1.00
Wheat, Duluth to Buffalo, bu.....	2.1959	1.8639	1.2299
Soft coal, Ohio ports to Milwaukee, net ton.....	46.05	40.00	40.00
Soft coal, Ohio ports to Duluth, net ton.....	34.85	30.00	30.00
Soft coal, Ohio ports to Portage, net ton.....	41.97	50.00	30.00
Soft coal, Ohio ports to Manitowoc, net ton.....	41.97	35.00	35.00
Soft coal, Ohio ports to Sheboygan, net ton.....	41.97	35.00	35.00
Soft coal, Ohio ports to Green Bay, net ton.....	41.97	35.00	35.00
Soft coal, Ohio ports to Escanaba, net ton.....	41.97	35.00	35.00
Hard coal, Buffalo to Milwaukee, net ton.....	45.38	41.062	40.00
Hard coal, Buffalo to Chicago, net ton.....	46.20	40.777	40.00
Hard coal, Buffalo to Duluth, net ton.....	35.19	31.256	30.00
Lumber, head of the lakes to Ohio ports.....	271.00	258.549	261.08

rates did not vary throughout the year; the wild rate holding steady at the contract figures, no advance being paid even for the final cargoes moved in December. Such a condition has never been known on the lakes before. During the summer months certain grain was carried from the head of the lakes at a cent a bushel. Many cargoes were carried from Chicago for 7/8 cents a bushel. Taken altogether, the season was the poorest in years. Following is the summary:

AVERAGE DAILY FREIGHT RATES, 10 YEARS, ENDING WITH 1908.

	Cents.
Iron ore, head of Lake Superior to Ohio ports, gross ton.....	82
Iron ore, Marquette to Ohio ports, gross ton.....	73½
Iron ore, Escanaba to Ohio ports, gross ton.....	63
Soft coal, Ohio ports to Milwaukee, net ton.....	48
Soft coal, Ohio ports to Duluth, net ton.....	36
Hard coal, Buffalo to Chicago, net ton.....	47
Hard coal, Buffalo to Duluth, net ton.....	36
Wheat, Chicago to Buffalo, bu.....	1.61
Wheat, Duluth to Buffalo, bu.....	2.08
Lumber, head of the lakes to Ohio ports.....	261.00

AVERAGE OF DAILY LAKE FREIGHT RATES ON HARD COAL FROM BUFFALO TO CHICAGO, MILWAUKEE AND DULUTH DURING TEN YEARS PAST.

Year.	Chicago. Cents.	Duluth. Cents.
1899.....	73	49½
1900.....	48	39½
1901.....	50	38
1902.....	42	33

LAKE FREIGHT RATES ON WHEAT, DULUTH TO BUFFALO.

Year.	Rate cts.	Year.	Rate cts.
1908.....	1.22	1894.....	1¼ @ 3
1907.....	1.86	1904.....	1¼ @ 3½
1906.....	2.19	1903.....	1.6
1905.....	2.31	1902.....	1.9
1904.....	1.81	1891.....	1¾ @ 9½
1903.....	1.6	1890.....	2 @ 5
1902.....	1.9	1889.....	2 @ 5
1901.....	2.3	1888.....	2 @ 5
1900.....	2.0	1887.....	2 @ 8
1899.....	3.6	1886.....	3¼ @ 8
1898.....	1.8		
1897.....	1.75		
1896.....	2.12		
1895.....	3.50		

Figures for 14 years past average of daily rates for full season; previous to 1895 rates given are highest and lowest of the year.

AVERAGE RATES ON WHEAT PER BUSHEL BY LAKE FROM CHICAGO TO BUFFALO.

Year.	Cents.	Year.	Cents.	Year.	Cents.
1860.....	9.89	1876.....	2.90	1892.....	2.38
1861.....	11.53	1877.....	3.72	1893.....	1.66
1862.....	10.49	1878.....	3.07	1894.....	1.27
1863.....	7.51	1879.....	4.74	1895.....	1.97
1864.....	9.58	1880.....	5.76	1896.....	1.70
1865.....	9.78	1881.....	3.44	1897.....	1.56
1866.....	12.34	1882.....	2.50	1898.....	1.53
1867.....	6.67	1883.....	3.41	1899.....	2.71
1868.....	7.14	1884.....	2.18	1900.....	1.79
1869.....	6.81	1885.....	2.02	1901.....	1.42
1870.....	5.88	1886.....	3.68	1902.....	1.51
1871.....	7.62	1887.....	4.13	1903.....	1.41
1872.....	11.46	1888.....	2.56	1904.....	1.32
1873.....	7.62	1889.....	2.51	1905.....	1.67
1874.....	4.03	1890.....	1.96	1906.....	1.72
1875.....	3.42	1891.....	2.38	1907.....	1.57
				1908.....	1.00

Average for 49 years, 4.30.

Charges to vessels for shoveling, trimming and tallying weights of grain amounted to \$4.12½ per 1,000 bu. in 1908.

AVERAGE LUMBER RATES, DULUTH TO LAKE ERIE PORTS.

Year	Rate per M.	Year.	Rate per M.
1908.....	\$2.61		
1907.....	2.58	1902.....	\$2.54
1906.....	2.71	1901.....	2.66
1905.....	2.45	1900.....	2.33
1904.....	2.54	1899.....	3.08
1903.....	2.57		

SCHOOL OF NAVIGATION A SUCCESS.

The school of navigation which was recently established by the board of education of San Francisco in connection with the Humboldt evening high school is meeting with much appreciation.

J. T. McMillan, nautical expert attached to the branch hydrographic office of the United States navy, is the instructor in charge of the course and since the class opened late in November has taught an average of 32 pupils. The class is made up of deck hands, quartermasters and mates of sea-going vessels, boatmen, members of the naval militia, yachtsmen and others.

It is anticipated that as the course in navigation becomes more widely known the attendance will increase to such an extent that larger quarters will be necessary.

The Revere Rubber Co., Boston, Mass., has just issued a most serviceable calendar for 1909. The type is large and can be seen at a considerable distance, the kind of calendar most suited to offices.

AVERAGE FREIGHT RATE ON IRON ORE PER GROSS TON FROM PORTS NAMED TO OHIO PORTS—TABLE COVERING WILD AND CONTRACT RATES FOR 20 YEARS PAST.

	Escanaba. Wild or daily rate.	Marquette. Wild or daily rate.	Lake Superior. Wild or daily rate.	Ashland and other ports at the head of the lake. Wild or daily rate.
1889.....	1.01	1.00	1.19	1.10
1890.....	0.89	1.10	1.07	1.25
1891.....	0.84	0.65	1.02	0.90
1892.....	0.74	1.00	0.98	1.15
1893.....	0.56	0.85	0.71	1.00
1894.....	0.46	0.60	0.60	0.80
1895.....	0.73	0.55	0.92	0.75
1896.....	0.52	0.70	0.66	0.95
1897.....	0.45	0.45	0.55	0.65
1898.....	0.51	0.45	0.60	0.62
1899.....	0.95	0.50	1.08	0.60
1900.....	0.69½	1.00	0.78½	1.10
1901.....	0.64	0.60	0.79	0.89
1902.....	0.59	0.60	0.66	0.70
1903.....	0.61	0.65	0.72	0.81
1904.....	0.53½	0.55	0.62	0.60
1905.....	0.61	0.60	0.70	0.77
1906.....	0.60	0.60	0.70	0.7555
1907.....	0.60	0.60	0.70	0.75
1908.....	0.50	0.50	0.60	0.65

Charge to vessels in 1908 for unloading iron ore was 20 cents per ton. The wooden vessels that required trimming paid an additional charge of about 3 cents per ton for that service.

Average ore rates for the entire period of 20 years: Escanaba, contract 67½ cents, wild 65 cents; Marquette, contract 81 cents, wild 78 cents; Ashland and other ports at the head of Lake Superior, contract 88 cents, wild 88 cents.

Average for past 10 years: Escanaba, contract 62 cents, wild 63 cents; Marquette, contract 71 cents, wild 73½ cents; Ashland and other ports at the head of Lake Superior, contract 78½ cents, wild 82 cents.

ATLANTIC COAST NOTES.

Office of the MARINE REVIEW,
Room 1005, No. 90 West St.,
New York City.

Incoming trans-Atlantic liners are still reporting extremely heavy weather encountered throughout the entire passage, and are arriving in New York harbor considerably overdue on that account. All have suffered to some extent from the heavy seas, but no serious damage is reported.

The Hamburg-American line has announced that the steamer Hamburg, which sails from New York on Jan. 5, will call at the Azores en route to Gibraltar and Mediterranean ports, this addition to the itinerary of the steamer being influenced by the increasing number of passengers to the Mediterranean at this season.

The steamer Amerika, of the Hamburg-American line, has arrived at New York with 1,984 third class and steerage passengers. The largest number hitherto brought to the port this year by one vessel was 1,545, brought by the Kaiserin Auguste Victoria, of the same line, on Dec. 8. The total passenger list of the Amerika was 2,465. The Amerika was 36 hours overdue on arrival.

The schooner Annie, from Honduras to New York, capsized during a heavy gale off Honduras, on Nov. 14, and sank with 70,000 cocoanuts and \$4,000 in silver. Captain C. A. Decker arrived last week at New Orleans on the steamer Harry T. Inge, from Belize, and reported that the crew, with his wife and child, had a narrow escape from drowning. The Annie hailed from Liverpool, N. S.

The board of pilot commissioners of Delaware, which met at Wilmington to investigate the stranding of the British steamer Cyrus in the Delaware river, on Dec. 16, found from evidence that the accident was due to the neglect of W. W. Norman, the pilot in charge of the vessel. Norman's license will be suspended for three months, after which time, if it is found on examination that his eyesight is satisfactory, the license will be returned.

The English and American Steamship Co., owners of the British steamship Murcia, has begun legal proceedings in the United States courts to recover damages from the Norwegian steamship Sif, of the Earn line steamship company. It is claimed that

while the vessels were proceeding in the Delaware river, on Nov. 26, the Sif overtook and attempted to pass the Murcia, and in doing so ran her down, causing damages to the amount of \$10,000. The agents of the Sif had to furnish \$15,000 before she could be released from the marshal's attachment.

The French cruiser Admiral Aube, now at Miquelon, has been directed to go in search of the overdue Fabre line steamship Neustria, which sailed from New York for Marseilles on Oct. 27, since which time she has not been heard of.

The act of congress requiring the United States local inspectors of steam vessels to look into the seaworthiness of barges, which goes into effect Jan. 1, will be the means of putting a number of old-time barges out of commission. Several have already been tied up, the owners knowing that it is impossible for them to come up to the requirements.

Two dangerous wrecks have been reported, one that of the water-logged Jennie Thomas, abandoned while bound from Savannah to Philadelphia, and the other an unknown wreck submerged with mast standing. The Jennie Thomas is awash and was seen on Dec. 9 in latitude 39, longitude 59. The unknown wreck was recently sighted in latitude 34.09 north, longitude 76.50 west, about 23 miles south, 64½ west, from Cape Lookout shoals lightship.

Particulars have reached New York of the wreck of the Falls of Halladale, on the Australian coast, on Nov. 9. The vessel was a four-masted bark, chartered by the United States & Australasia Steamship Co. of New York, and sailed from New York on Aug. 4. She was 100 days from New York when lost, the accident being due to a land fog concealing the rocky coast. Her cargo was valued at \$250,000, consigned to Melbourne and Sydney.

The first of a number of steel coal barges building for service in the transportation of coal from the storage yards at Perth Amboy to points along the eastern coast, has just been launched by the Lehigh Valley Railroad Co. The barge is 200 ft. in length over all, breadth, 35 ft., and depth of hold, 17 ft. 6 in. It has water-tight bulkheads in bow and stern, and is divided by three steel

bulkheads into four bins. There are three masts carrying leg-o'-mutton sails, a lifeboat and dory.

The ship Dirigo, in command of Captain Goodwin, from Baltimore, Oct. 26, for Honolulu with a cargo of coal, recently put into Rio Janeiro in distress. She sprang a leak at sea six days off Rio Janeiro.

EUROPE'S WATERWAYS.

Berlin, Germany, is now anxious to become a seaport and a project has been put under way for the construction of a maritime canal from the Baltic sea to that city, as the Kaiser Wilhelm canal, now but a few years old, has been found entirely inadequate.

It is probable that with Germany's rise as a sea power there will come a considerable development of her waterways. This project to double the width and increase the depth to 40 feet on the Kaiser Wilhelm canal can be accomplished only at a cost of \$1,000,000 per mile.

Germany's example is felt by her neighbors. Brussels, Ghent and Bruges are engaged on similar projects. Russia has an elaborate project in view for enlarging the waterway from the Baltic Sea to the Caspian, a project not unlike our own from the lakes to the gulf. Great Britain has a royal commission appointed for the purpose of ascertaining the feasibility of developing an elaborate system of waterways which will involve an expenditure larger than the total amount expended on our rivers and harbors up to date. Throughout an extended tour of the Russian waterways from the Baltic Sea to the Volga River, J. A. Ackerson, the St. Louis engineer and student of inland waterways, found a continuous stream of traffic. In the River Lek and its connecting canal to Amsterdam the traffic amounts to over 60,000 vessels of all kinds per annum.

The Falls Hollow Staybolt Co., Cuyahoga Falls, O., has appointed Willis C. Squire, 209 Western Union building, Chicago, as its representative for the railroad trade in the Chicago territory, and Alex. S. Mitchell, 45 Broadway, New York, for the railway and boiler trade in the New York territory.

The steel tug Francis D. Hackett, built for the Hackett Wrecking & Towing Co., of Amherstburg, was launched from the Johnston & Bros. ship yard at Ferrysburg, Dec. 22.

Accidents of a Month.

The accompanying list of accidents to the lake fleet during the past six weeks shows that seven vessels were totally destroyed, viz.: Steamers Pascal P. Pratt, North Star, D. M. Clemson and Vivian, and the schooners Berwind, Houghton and Belle. The steamer D. M. Clemson, which foundered on Lake Superior, is the heaviest loss of the season. She was bound for Duluth with a heavy cargo of coal, and her entire

crew of 23 men were lost. The steamer Pascal P. Pratt, loaded with a cargo of coal, burned to the water's edge near Long Point, Lake Erie. The steamer North Star was sunk in a collision with the steamer Northern Queen off Port Sanilac, Lake Huron. Other vessels which suffered serious injury were the steamer John C. Pringle, which stranded at Euclid Creek, Lake Erie; the steamer Mohawk, which ran ashore on Gravel

Island, Lake Huron; the steamer John Stanton, which ran ashore on Iroquois Island, Lake Superior, and the steamer James Davidson, which ran ashore in a heavy snow storm on Kettle Point, Lake Huron. The tug Yale, which turned turtle in Buffalo river while endeavoring to pull the steamer Yale clear of the Nettleton, will be raised. Frederick Stillier, fireman on the tug Yale, was drowned.

DATE.	NAME OF VESSEL.	NATURE OF ACCIDENT.	PLACE.
Nov. 10	Str. J. M. Jenks.....	Grounded at Michigan Street bridge owing to low water; draw held open seven hours	Milwaukee harbor.
Nov. 11	Str. Jno. C. Pringle.....	Stranded in storm; badly pounded; entire upper works carried away; engine and boiler damaged; leaked very badly; released on 19th; temporarily repaired and taken to Detroit for repairs.....	Euclid Creek, Lake Erie.
Nov. 12	Str. Jas. E. Davidson.....	Struck a bar while trying to enter harbor in storm.....	Lorain harbor.
Nov. 12	Str. Maricopa	Hit dock; one plate damaged; leaked in No. 4 tank; patched up and continued on trip	Canadian Soo.
Nov. 12	Str. Wm. M. Mills.....	Ran aground owing to low water; released.....	Bar Point, Detroit river.
Nov. 14	Fire Tug Grover Cleveland.....	Rammed by Str. Saranac; badly damaged.....	Buffalo.
Nov. 14	Sand Str. Paul Kruger.....	Broke away from tug Henry which was working on stranded steamer Pringle and ran ashore in heavy sea.....	Lake Erie near Euclid Creek.
Nov. 15	Str. F. R. Buell.....	Stranded in heavy weather; released on 18th, after lightering 60,000 ft. of lumber; had line in her wheel, but was not damaged; went to Tonawanda with Sch. Stewart.....	Lake Erie, near Southeast Shoal.
Nov. 15	Sch. A. Stewart	Stranded in heavy weather in tow of Str. F. R. Buell; bad list; entire load of lumber lightered; released Nov. 23; towed to Tonawanda, where she was docked	Lake Erie, near Southeast Shoal.
Nov. 16	Str. Thomas Adams	Grounded owing to low water.....	Lake St. Clair.
Nov. 17	Str. Neebing	Ran on rocks; forward tanks full of water; released on Nov. 17 by a fish tug	Outside of Goderich harbor.
Nov. 17	Sch. Mary Woolson.....	Broke away from Str. Charles H. Bradley which towed her.....	Lake Superior, near Houghton.
Nov. 18	Str. Adriatic	Struck obstruction, thought to be anchor of Str. Weston; forepeak and No. 2 and 3 tanks leaked; docked at Ecorse for repairs; a dozen or more damaged plates.....	Bar Point, Detroit river.
Nov. 18	Str. James P. Walsh.....	Struck obstruction	Bar Point, Detroit river.
Nov. 18	Poe Reef Lightship No. 62.....	Anchor chain parted, causing her to drift; tug sent after her; placed in position	Straits of Mackinaw.
Nov. 19	Str. Pascal P. Pratt.....	Caught fire; burned to water's edge; loaded with hard coal; 1,800 or more tons of coal saved; vessel total loss; fire started in engine room	Lake Erie, near Long Point.
Nov. 19	Str. John A. McGean.....	Bow caught rigging of hoisting machine, tearing it down; two men killed; steamer not damaged	Lackawanna Steel plant, Buffalo, N. Y.
Nov. 20	Str. Emerald	Collided with sand sucker Houghton, owing to misunderstanding of signals; entire starboard side torn away; badly wrecked; finished patching her up and pumping out on Nov. 27.....	Detroit river.
Nov. 20	Sand Sucker Houghton.....	Collided with Str. Emerald; slightly damaged.....	Detroit river.
Nov. 21	Str. City of Mt. Clemens.....	Collided with Str. Neilson; hit on starboard quarter and sank; moved into shoal water	Lake St. Clair.
Nov. 21	Str. Neilson	Collided with Str. City of Mt. Clemens.....	Lake St. Clair.
Nov. 22	Str. Laughlin	Stranded while gas buoy was out; released on Nov. 24, after lightering 800 tons of ore; uninjured	Point Iroquois, Lake Superior.
Nov. 22	Str. W. H. Wolf.....	Struck while coming down; docked when she arrived at Cleveland.....	Canadian canal, Sault.
Nov. 22	Str. D. R. Hanna.....	Stranded; released after lightering part of cargo.....	Bar Point, Lake Erie.
Nov. 23	Tug Alert	Ran on rocks in fog while towing a scow; hit by scow; tow post and timber heads pulled out; later broke in two and sank in 14 ft. of water	Livingstone channel, Detroit river.
Nov. 23	Str. Midland King.....	Stranded while entering channel; out 3 ft.....	Canadian canal, above Sault.
Nov. 24	Sch. Berwind	Broke away from Str. Vail and stranded; pounded to pieces.....	Pilot Island, Lake Michigan.
Nov. 24	Str. S. R. Kirby.....	Ran ashore in heavy weather; released herself on Nov. 25, uninjured.....	Chicanola reef, Lake Erie.
Nov. 25	Str. North Star	Collided with Str. Northern Queen in heavy fog; sank immediately in 90 ft. of water; struck on starboard side abreast of the pilot-house; total loss.....	Off Port Sanilac, Lake Huron.
Nov. 25	Str. Northern Queen	Collided with Str. North Star in heavy fog; bows badly damaged at water line; temporarily patched up and went to Superior ship yard for repairs	Off Port Sanilac, Lake Huron.
Nov. 25	Str. Mohawk	Ran ashore on flat rock, loaded with package freight; shoe, rudder and wheel lost; two starboard tanks punctured; leaked badly and water in cargo hold; released Dec. 6, after lightering 500 tons; taken to Detour and later to Ecorse to be docked.....	Gravel Island, Lake Huron.
Nov. 25	Sand Str. Protection	Struck a rock; sank in 13 ft. of water.....	Cedar Point, Lake Erie.
Nov. 26	Str. Amazonas	Stranded; released after lightering part of her cargo; not damaged.....	Vidal shoals, near Soo.
Nov. 26	Str. Dunelm	Grounded; leaked	Near Point Ann, Lake Ontario.
Nov. 26	Str. Bennington	Stranded on rocks; leaked; released after lightering; went to Ogdensburg for repairs	Lake Ontario, near Brockville.
Nov. 27	St. Bge. Topeka	Grounded on a bar while entering port; released, uninjured.....	Holland, Mich.
Nov. 27	Str. Niagara	Grounded while trying to make Merrill & King dock.....	Duluth.
Nov. 28	Str. Fred G. Hartwell.....	Broke from her moorings; spar hit an arm of unloading machine; foremast badly damaged	Ashtabula.
Nov. 29	Str. Kongo	Crashed into unknown steamer while leaving port; some stanchions on port side broken and cabins shoved out of position.....	Buffalo.
Dec. 1	Str. Bulgaria	Arrived at Port Huron in badly damaged condition, after rough trip on lake; repaired at Port Huron	Lake Huron.
Dec. 1	Str. Iroquois	Lost both anchors while out in heavy weather.....	Livingston channel, Detroit river.
Dec. 1	Dredge Old Glory	Frame, dipper and dipper handle fell into lake.....	Livingston channel, Detroit river.

DATE.	NAME OF VESSEL.	NATURE OF ACCIDENT.	PLACE.
Dec. 1	Str. Alfred Mitchell	Ran aground, owing to low water; released, uninjured.	Bar Point, Lake Erie.
Dec. 2	Str. F. L. Robbins	Stranded owing to low water; floated when water rose next day.	Bar Point, Lake Erie.
Dec. ..	Str. Lyman C. Smith	Stranded owing to low water; released, uninjured.	Bar Point, Lake Erie.
Dec. ..	Str. Thos. Shaughnessy	Stranded owing to low water; released, uninjured.	Bar Point, Lake Erie.
Dec. 2	Str. Tempest No. 2	Hit by barge King, which was torn from her moorings by the steamer Juniata; stern considerably damaged; leaked badly.	Erie.
Dec. 4	Str. Victory	Steering gear broke; stopped at Port Huron for repairs.	St. Clair river, near Port Huron.
Dec. 4	Str. Sinaloa	Ran aground in thick snow storm; released after lightering 300 tons of coal, uninjured.	Bar Point, Lake Erie.
Dec. 4	Sch. Houghton	Sprung a leak and sank; total loss.	Lake St. Clair.
Dec. ..	Str. D. M. Clemson	Wreckage found on lake indicating that steamer was lost during storm; entire crew of 23 lost; cause unknown, but thought to be damaged machinery.	Lake Superior.
Dec. 6	Str. Eber Ward	Crashed into Taylor Street bridge; bow badly damaged; bridge put out of commission for a time.	Chicago river.
Dec. 6	Str. Davidson	Ran aground in heavy snow storm.	Bois Blanc Island, Straits of Mackinaw.
Dec. ..	Str. John Stanton	Ran ashore in heavy weather; No. 1 tank full of water; leaked very badly; lightered 35,000 bu. of grain; stopped at Detroit; will be repaired at Lorain.	Iroquois Island, Lake Superior.
Dec. ..	Str. Harlem	Stranded in heavy weather owing to low water; released herself, uninjured.	Bar Point, Lake Erie.
Dec. ..	Scow	Broke away from tug L. P. Smith; lost.	Lake Erie.
Dec. ..	Pass. Str. Vivian	Sank.	Waddington.
Dec. 9	Str. Harvey Brown	Ran aground; released, uninjured.	Bar Point light, Lake Erie.
Dec. ..	Str. Diamond	Picked up in disabled condition and taken to Sheboygan.	Lake Michigan, off Sheboygan.
Dec. 11	Sch. Belle	Tow line parted; towed by Str. F. W. Fletcher; drifted on beach; crew had narrow escape; probably total loss.	Lake Michigan, near Big Point Sable.
Dec. 13	Str. Wissahickon	Grounded at entrance to harbor, owing to low water; released.	Erie, Pa.
Dec. ..	Str. Jas. E. Davidson	Ran ashore in heavy snow storm; forward compartments full of water; No. 2 and 3 tanks punctured; released on Nov. 16 after hard pulling and lightering 50,000 bu. of cargo; reloaded lightered cargo and went to Buffalo to unload; will go to Toledo for repairs.	Lake Huron, Kettle Point.
Dec. 13	Tug Yale	Turned turtle while pulling a steamer; fireman drowned; sank to bottom of riser; to be raised.	Buffalo river.

SHIP YARD NOTES.

The Maryland Steel Co., Sparrows' Point, Md., has nearly completed a rock drill barge which is to be taken down and shipped to the Isthmus of Panama in knock-down condition. The barge is 112 ft. long, 36 ft. beam and 8 ft. depth of hold, and is to be used by the canal commission for drilling submerged rock.

The Wallace Ship Yards, Ltd., Vancouver, B. C., have recently added a marine ways and machine shop to the repair facilities at this busy port. The company is at present able to dock vessels up to 250 ft. in length and is also prepared to execute repairs to machinery and boilers.

Sloan Bros., Seattle, Wash., launched the passenger steamer Vashonian on Dec. 12. The Vashonian is building for the Vashon Steamboat Co. and is 125 ft. long, 22 ft. beam and 9 ft. deep. She will run on the island route between Seattle and Tacoma and is expected to be in service early in the new year. The Vashonian will probably prove one of the fastest boats of her size on the sound.

The Willamette Iron & Steel Works, Portland Ore., launched the steel passenger steamer H. B. Kennedy recently. The Kennedy is a fine vessel, being designed for the Port Orchard route, and was built to the order of Capt. Kennedy. She is 190 ft. long over all, 28 ft. beam and 12 ft. 6 in. deep, having a displacement of 500 tons. The contract calls for the completion of the vessel by April 1, 1909. She is to be fitted with triple-

expansion engines of the four-cylinder type, the cylinders to be 17, 28, 34 and 34 in. diameter by 24-in. stroke. The engine is to develop 2,000 H. P. and is expected to give the vessel a speed of 20 miles per hour.

The Maryland Steel Co., Sparrows' Point, Md., is rushing work on the three naval colliers Venus, Mars and Vulcan. The open weather prevailing has been very advantageous and the keels, center keelsons and deep tanks are in place as well as some of the bulkheads, the stern posts and a few of the scantlings. Work is also progressing satisfactorily on the engines and boilers.

The Gas Engine & Power Co. & Charles L. Seabury & Co., Cons., Morris Heights, N. Y., have recently been awarded a contract for the construction of the largest power yacht ever built. It is to be 115 ft. long, will have a speed of 26 miles an hour, and is to the order of Julius Fleischman, of Cincinnati. The same company has a contract for building a twin-screw steam yacht 133 ft. long for M. C. D. Borden.

The Tebo Yacht Basin Co., of Brooklyn, N. Y., is to build a vessel for the Carnegie Institute, in which neither iron or steel will be used. She is intended for use in magnetic survey work and is to be of 800 tons burden, 155 ft. long, 33 ft. beam and 12 ft. draught. The craft is to be barkentine-rigged and will be supplied with auxiliary power by a gas engine capable of driving her at a speed of six knots. The construction

is to be of wood, copper and bronze exclusively, no steel nails, wire rigging or electrical apparatus being allowed. Delivery is to be made in July, 1909.

R. L. Bean, Portland, Me., has been awarded contract for the construction of a three-masted schooner for Capt. William Nelson, of Boston, Mass. She is to be of 800 tons capacity and will be launched early in the summer. The three-masted schooner which is being built at this yard for Capt. W. H. Theall, of Chelsea, Mass., is to be launched some time in February.

Thomas McCosker, the well-known Baltimore ship builder, is closing up his business of building wooden vessels, in which he has been engaged with singular success for the past 38 years. The last vessel to be built at the yard was the Albatross, the largest wooden tug ever built in Baltimore, which was launched last May for the P. Dougherty Towing Co., of that city. She is 141 ft. 9 in. long, 26 ft. 3 in. beam and 14 ft. deep.

Crawford & Reid, Tacoma, Wash., are about to launch a large and well-equipped steamer for use in halibut fishing in northern waters. Her name has not as yet been announced. She is to the order of Capt. W. J. Weidling, of Richmond Beach, Wash., and is 120 ft. long, 22 ft. beam and 14 ft. deep. She is being fitted with triple-expansion engines of 600 H. P. which are expected to drive her at a speed of 12 miles per hour. She will carry a crew of 30 men.

Naval Architects and Marine Engineers.

The seventh paper read at the annual meeting of the Society of Naval Architects and Marine Engineers was upon the subject "Influence of Free Water Ballast upon Ships and upon Floating Docks," by naval constructor T. C. Roberts. The scope of the paper was outlined in the author's opening paragraph.

"The following notes have been devised so as to cover the theories governing the various considerations of stability of a floating dock throughout its various operations and the aim has been to limit the theoretical considerations to a minimum, while making it cover sufficient ground to obtain a clear understanding of the underlying principle and the direct application to a given case in hand. The calculations of girder strength of an existing floating dock have also been included, giving the results and methods by which obtained. The stability and strength of a dock concern both the designer and user and the writer has endeavored to connect the two by assembling the theories and forms variously scattered about within the science of naval architecture, the applications being reduced to direct and brief forms. The structural details of floating docks have been sufficiently treated by various writers in current literature and in this case are sufficiently indicated in the accompanying plans. My object in approaching the subject in such elementary fashion is to lead up to certain applicable formulae, endeavoring to produce a self-contained article. To do this I will begin in terms of ships and loss of stability due to free water ballast and will include, in passing, a consideration of the latter also."

DISCUSSION.

Mr. Mason S. Chace: I think we should all thank Mr. Roberts heartily for putting before us this formula connected with calculations for stability and strength in building these docks, together with examples which show how these calculations can be applied, and have been applied, in the case of one dock in particular, so that if any of us have occasion to make a dock we will know how to go at it and follow the matter through in a systematic way, such as Mr. Roberts has put before us, starting with the fundamental formula as applied to a ship, a ship with free water ballast, and apply that to a dock.

On page 15, Mr. Roberts refers to the question of the breaking of the dock at Pensacola, but says this dock had five pontoons instead of three. He does not tell us why the dock broke, and it would be interesting to know whether there is an advantage in making the dock of three pontoons, and whether this breaking of the dock was due, to some extent, to carelessness in handling during the docking.

It would be interesting if he would tell us how the method referred to, of using fish-plates and bolts has been modified in our later docks. I had the pleasure of seeing this dock at New Orleans.

There is one other question referred to on page 18, where he says that the docks were not pickled. I thought it was the custom in our naval service to pickle the shell of our vessels, and the docks would have been pickled in the same way. That has not been done, and probably because they had to remain in fresh water, and not in salt water, and consequently the pickling was not necessary.

Prof. C. H. Peabody: This paper is especially valuable, as being a logical development of the treatment of the problem which we find in all text books, but which is there never carried to a conclusion. It would be undesirable or impossible to treat it in such fashion. In fact, as the last speaker intimated, one would look far before he would find so complete a statement of the problem as worked out in this paper.

I wish to speak of the matter on page 5. The table there given shows that the advantage in the use of bulkheads is that they break up compartments very quickly, because of the practical limit beyond which it is not profitable to go. I have never seen that stated so clearly. On page 6, in the second paragraph, Mr. Roberts gives a statement "that $\cos. \delta$ is greater than $w \times \sin. \delta$, even though the latter has an effect upon the initial stability dependent only on the free water surface and independent of its weight." I have no doubt that Mr. Roberts is quite right, because of the thorough manner in which he has treated this work, but I wish he would make it a little more evident, because this was not evident to me at sight.

I want also to raise the question on page 15, where he states, towards the middle of the page, "it is also

customary on the part of some to consider that the side walls of the dock should be built with sufficient girder strength to carry the entire load," then he proceeds to say that the strength of the dock should be computed as one entire structure, but he has in the same paragraph spoken of the fact that they should be bolted together, and I have some question whether it would not be desirable to treat them bolted, for computation, as being incomplete, in which case the method he speaks of as being customary, might be one extreme, for which it might be desirable to make a calculation giving one of the sort which he has mentioned.

The Vice President: Any further discussion?

Mr. William T. Donnelly: I do not know that I can add anything to the data given in this paper relative to the application of the naval dock now in use by the United States navy. I would, however, call attention to some difference in the commercial dock with which I am familiar. First, in the matter of placing the vessel in the dock, we place the vessel exclusively in the length of the dock, when it is less than the length of the dock, and it has been shown by this paper that it is causes unusual stress longitudinally upon the middle of the dock, but that is counteracted by allowing water to remain in the end pontoon. That would disregard the idea of the uniform pumping of the structure. Now, in all commercial practice, in handling smaller vessels, it is the practice to place the vessel at one end of the dock. We then pump the dock as a whole to maintain its longitudinal length. That automatically gives the corresponding condition of water level and condition of bottom, and has the automatic function of eliminating the strain due to the centralizing of the weight at the center of the beams. Again, in the matter of transverse stability, that is obtained in the commercial dock, not by making positive longitudinal divisions, confining the water, but in making a number of compartments, and connecting them with such a restricted water inlet that the flow of one to the other shall be less than the maximum capacity of the pump for that particular line of compartments, there being, however, a central division along the longitudinal axis of the dock, such as to operate any flow of water.

I might further say that we do not countenance in our practice, in the larger docks, the placing of any gates that open in the center wall. That has been done in the dock Dewey. The matter of stability is maintained entirely by the relative volume of the wings or walls to the total lifting power of the dock, in relation, of course, to their distances to the central axis, the function being such that if pumping is stopped at any time, for any cause, the water settling will leave the dock with a large maximum of safety, so far as transverse stability is concerned. The matter of the pumping power exceeding the flow through the passages when locked together, gives added function to the control of the dock. If there is any tendency of the vessel to roll the pump on that side can be increased, and the weight of water thrown out will be taken from the end of the beam, and will become a real factor in effecting the control of the dock.

In the matter of the division of the dock, that is more a matter of the dividing of the pumping, as commercial docks are ordinarily handled, more a matter of multiplying the pumping appliances than of centralizing the pumping power, and connecting the valves, the idea being to have water-tight divisions without the necessity of valve connections, with the possibility of their being left open. Of course, the subject of floating dry docks is a very large one, and I only care to call particular attention to these points at the present time. There are many problems that will have to be worked out more definitely as the science in connection with these docks progresses.

Capt. W. Hovgaard: I am glad that I have some little share in the appearance of this paper. Last spring I had the pleasure of seeing Mr. Roberts, who showed me the great amount of work he had done in this line, and I advised him strongly to publish it in the form of a paper. I am glad that he has now done so, for I feel convinced that the paper will be of great practical value not only to the builders and users of floating docks, but also to teachers. As far as I am aware there exists no connected, complete treatment of this subject in point. I have only one thing to criticize, and that is in itself unessential, since it deals, not with the treatment of the problem, but only with the use of certain symbols. Still I believe it is worth while to explain at length why I make this criticism, because the explanation may be helpful to those who are not familiar with the sub-

jects of the stability of ships containing free internal water, and it may thus form a supplement to the paper which it is hoped may be useful. Let W and U refer to the ship in empty condition, in which case (see Fig. 1) the moment of stability is $M = W \times GM \sin \delta$. Now suppose bilging to take place, and that the quantity of water of weight, w , and volume, v , is admitted into the ships. We may deal with the problems in three different ways: First, the water in the bilge is considered as belonging to the ships and as concentrated in w , the meta-center of the free water (see Fig. 2). Let G be the common center of gravity of the ship and the water so placed. Then the moment of stability is $M_1 = (W \text{ plus } w) G, M_1 \sin \delta$, where W is determined by

$$B, W = \frac{I}{V \text{ plus } v}$$

Second, the volume of the ships occupied by free water is considered as belonging to the sea. The center of gravity of the ship remains at G , but the center of buoyancy goes up to B_2 (see Fig. 3). There are now two free-bounding surfaces, that of the ship's water line and the surface of the water in the bilge. We have

$$B_2, W_2 = \frac{I - i}{W} \text{ and the moment of stability is } M_2 = W - G M.$$

Third, the free water is at first considered solidified and the common center of gravity of this water and the ship is at G (see Fig. 4). When the ship heels over, the water in the bilge actually shifts to b , and thus the amount of stability (W plus w) $G M$ will have to be reduced by a couple $w, bb = w, bu$.

Now, it will be found that all three methods give the same result, in other words $M_1 = M_2 = M_3$.

Mr. Roberts has used the third method, and he has used it perfectly correctly, but now consider formula (1) and (2) in his paper. Formula (1) refers to the empty ships, formula (2) to the ship after bilging, but the same symbols, W, V , etc., are used. A comparison between his formula (2) and my formula (4) will show that W plus w and V plus v should be used instead of W and V and that both G and U are different in the two cases. As will be seen from the paper, however, Mr. Roberts in his subsequent treatment attaches the correct meaning to the symbols, so that my criticism concerns only his choice of symbols, which I think is likely to be misleading to beginners.

The Vice President: Is there any

further discussion?

Mr. Leonard M. Cox: To any one who has suddenly been called upon to assemble for himself the "theories scattered about within the science of naval architecture," to glean the essentials and eliminate the non-essentials, and apply the results to the various conditions of loading and flotation to which a floating dock is subjected, this very excellent paper will appear in the light of a timely contribution to dock literature; of primary interest to the dock operator in that it sets forth in proper order simple methods for determining that knowledge of his tool which every operator should possess; it is of equal interest to the designer in giving him a general view, so to speak, of what he has hitherto seen in such a mass of detail as to endanger his sense of perspective.

Although stability and strength determinations for floating docks are based upon nothing more complex than the most elementary principles of floating bodies and resistance of materials, the problem of making such determinations for every position and every condition of an actual structure—when carrying ship load, operating free, self-docking, and at sea—and interpreting results as affecting the dock as a whole and each separate element is one of greater complexity than would appear at first glance. It has been well said that theoretical calculations for docks, like those for ships, are of great value as guides in fixing general dimensions and type, but in actual work so much depends upon structural considerations, local conditions, education and skill of operators, and, last but not least, the judgment and experience of the designer, that it is impossible to formulate a set of rules strictly applicable to every situation and condition.

The effective limits to the increase in number of compartments in a transverse section are clearly shown in the table giving value of GM —

for varying values of —, but these theoretical results can have but little value in the case of large floating docks, since for reasons affecting strength and general design, there can rarely be less than six. This is seen from the fact that it is necessary to provide a heavy longitudinal girder under keel blocks; that intermediate longitudinal bulkheads between keel blocks and side-walls are desirable for stiffness, if for no other reason; and that side-walls are sep-

arated from the pontoons in all modern types, in order to secure control of pumping, if not for considerations affecting stability, all longitudinals are made water-tight.

The problem of loss in stability due to free water in a side compartment is of interest in the special application made to the determination of angle of heel for any stage of water contained in compartments. This determination is always made in the case of docks that self-dock their side walls by listing. The calculation is only made for the purpose of ascertaining the maximum list possible and the corresponding strain on water-tight bulkheads. In actual operations the listing is accomplished by dock masters who are usually innocent of any knowledge of the finer tools of the profession, and the procedure in general is the simple one of pumping light on the side to be raised and admitting water to the opposite compartments until the desired degree of heel is attained. Foreseeing such methods the prime aim of the builder should be to so design each member that it may safely bear the maximum load to which it may possibly be subjected.

The curves for indicating the depth of contained water for each draught of the dock are especially interesting. In designing a dock the maximum head of water to which skin-plating and water-tight bulkheads will be subjected are first calculated, and then the depth of contained water for various draught lines, both with and without ship loads are plotted and curves traced. The practical value of such curves, however, is not great, since the levels of the water in the various compartments are seldom if ever the same at any time throughout the career of a dock. With a ship load it is customary for the intelligent dock master to regulate the pumping by the character of his ship. He will endeavor to carry a certain excess of water in the forward and after compartments when docking a short and heavy ship and will always, even when operating the dock empty, carry excess water in his side-walls to enable him to control trim. This feature of dock operation would justify a doubt as to the wisdom of increasing the depth of the watertight compartments of side-walls to give storage space. As a matter of fact certain types of docks maintain the two center compartments of pontoons watertight and dry in order to decrease the pumping head.

The method proposed for determining stability, while ingenious, does

not appear to offer advantages over the customary method of tabulating calculations for each factor affecting the co-efficient of stability for varying water lines. The customary formula for metacentric height is

$$I+I'-AV-Ei \quad (1)$$

$$H = \frac{V}{\dots}$$

in which V represents volume of displacement; A , difference between metacentric radius and metacentric height; and I , I' , and i have the same significance as in the paper. In the same way the expression for co-efficient of stability may be written

$$C = \frac{I+I'-VA-Ei}{\dots} \quad (2)$$

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It will be seen that this expression is equivalent to that used by the author, equation 14 of page 9.

In the practical use of these expressions, calculations are made and tabulated in such manner as to give all necessary factors for each water line. The table when completed gives in its columns the height of centers of gravity; heights of centers of buoyancy; their difference, A ; the volumes of displacement, V ; the moments of inertia of waterplanes, I and I' ; the moments of inertia of interior water surfaces, i ; the value of H from (1); the co-efficient of stability from (2); and the moment to heel 1° from

$$M = \frac{I-I'-VA-Ei \times 0.0175}{\dots} \quad (3)$$

35

The water lines generally used are those at the designed freeboard with test ship, at pontoon deck, at tops of keel blocks, and at such additional draughts as may be necessary to determine the curves. Should there be altars, openings or other peculiarities of the design affecting stability, additional water lines are placed when such special features occur.

These curves usually shown are those for metacentric height, co-efficient of stability, and moment to heel 1° , with scales so chosen as to permit the representation of all necessary stability data on one sheet. Such sheets are prepared for the dock under each of the following conditions: operating as a unit without ship load; operating under a long ship, such as the modern cruiser; under a ship which overhangs bow and stern such as the modern merchant steamer whose keel length is not greater than the length of keel blocks; under a short and heavy ship, such as the test battleship; and under such other special loads as the future use of the dock may sug-

gest. Sheets are also proposed for the dock as a whole and for each independent unit of the dock for each position assumed in self-docking.

It should be remembered that at the so-called critical points such as at the pontoon deck and the top of keel blocks, the least inclination will result in the cutting of a greater water-plane, thus increasing the stability. As a matter of fact, docks without altars can heel farther at a point midway between tops and bottoms of keel blocks than at either of those points.

That part of the paper treating of the strength of floating docks is well stated and covers the general theory of the subject. On a former occasion the speaker has made the recommendation that a book containing complete data for each naval floating dock be placed in the hands of every dock operator. For this book such curves as are given in Figs. 16, 17, 18 and 19, of the paper, are ideal.

It is the custom of the navy department to specify the assumption of a flexible ship for purposes of dock design. This is virtually the same as the assumption, recommended by the author, that the weights of both dock and ship act virtually downward against the vertical buoyancy opposed, but that the resultant moments are withstood by the dock alone.

Stiffness and rigidity are desirable qualities in a naval floating dock and their attainment is favored by designing the side-walls as beams carrying the total load transmitted through the transverse pontoon girders. Such an assumption is very nearly the correct one in the case of the solid trough dock or docks of the Cunningham type, the Clark and Stanfield bolted sectional type, or the Maryland Steel Co. type as exemplified in the "Dewey."

In the actual design of a dock, after preliminary shear and moment diagrams are drawn from assumed dimensions and the test ship, each member is taken up and designed in detail for local loading. The transverse pontoon girders are designed with the ship on three supports, i. e., the keel and bilge blocks; then the keel and intermediate longitudinal bulkheads together with the frames; then the side-walls to which the transverse girder reactions are transmitted; and finally the innumerable details of connections, skin plating, etc. With these data, new calculations of weights and moments of inertia are made, and new shear and moment diagrams are drawn. Reinforcement is applied where indicated by the

moment diagram and the process repeated until requisite strength is provided at every section on the dock. These calculations are made for every loading and every condition to which the dock may be subjected and at every point where the section undergoes appreciable change.

Touching the question of the towing of docks, and especially the towing of the "Dewey," to which the author refers, it would seem that the history of that expedition indicates that its frequent breaking adrift was the result of trying to make too much speed under adverse weather conditions and using too short a tow line. All the mishaps occurred during the first half of the voyage, and, as experience was gained and possibilities realized, such occurrences ceased. In the opinion of the speaker, the best results in towing a floating dock will be obtained by the use of the longest tow-line that can be handled and by accommodating the speed to weather conditions. It is certainly better to make no headway at all, or even some leeway, than to part a tow-line. By using one vessel of sufficient weight and power to do the towing, the strain on the tow-line may be quickly regulated and maneuvering may be simplified.

Model tank experiments with dock models would, in all probability, be productive of much information bearing on the proper shape of the underwater body for a practical minimum of towing resistance. While the mobility of the floating dock is a distinct advantage, it must be remembered that speed and towing qualities are of only secondary importance as compared with its adaptability to the docking of ships, but wherever the design can be so developed as to provide for the docking qualities and at the same time improve the towing qualities without prohibitive increase in cost, it should be done by all means. To accomplish this the speaker, some years ago, recommended that pontoons of floating docks be given scow ends.

Pointed or bow ends for docks were not recommended by members of the firm which towed the Algiers dock to its destination, all of whom were experienced tow masters and all of whom accompanied the expedition. It was stated that the dock was seldom pointed fair to its bridle after leaving the Virginia capes,—in fact members of the expedition aver that both leads of the bridle were usually sawing away on the same side fender.

The opinion of Mr. H. T. Hansson, who accompanied the Dewey expedition is thus expressed:

"It would, without doubt, greatly reduce the towing resistance if the ends were given some less resistant shape than square, and the writer thinks the scow shape would be preferable to the pointed ends sometimes used on docks. A floating dock will always make an angle with the course in any wind as long as it is not from dead ahead, so that, if a dock has pointed ends, the sides of these would always be more or less equare against the direction in which the dock is moving, whereas, if the ends are scow-shaped, the angle would always remain the same, besides which, the scow shape has the advantage of not reducing the deck area, as would be the case with pointed ends."

With the author's remarks on the durability of steel floating docks, the writer of this discussion is in hearty accord. No reliance can be placed in weathering, scraping or brushing, for the removal of scale, and there can be no doubt as to the ultimate economy of pickling.

The Vice President: If there is no further discussion, I will call on Mr. Roberts to close the discussion.

Mr. T. G. Roberts: First answering Mr. Chace's question, he asked why the Pensacola dock broke in two. The Pensacola dock has five pontoons—it has openings the same. (Mr. Roberts then drew a diagram on the blackboard). These are the five pontoons (the subsequent design having three pontoons, which is a better design). This break between the docks is a disconnection of all the bolts. Between that line and that line, all the stiffness of these braces, there is a break between this interim, and also at the inner edge of this, and of course, the maximum moment coming in the center of the dock, and increasing near the center, and being greater over here it was exactly in this section that the Pensacola dock broke. There was an investigation at the time, and various people had to do with the dock, stated that this dock, which was designed by Clark & Stanfield, in England, and which was sold to the United States government—the old Havana dock, 10,000-ton dock, and brought to Pensacola—that great economy had been used in its manufacture, and the plates were too thick. The investigation brought out that at the time of the self-docking of this dock, two end pontoons had been disconnected, and the dock lowered, and then connected at a higher level, and for some reason or other the dock master failed to open the valves, when he was leaving, and the flowing

water, exceeding the running out, let in to such an extent, and the force being exerted at the end tended to break the dock, and there were several causes which led to the break. That is where the break occurred (indicating on the blackboard), and that is what designers are looking out for. I do not think the design will ever be repeated. Mr. Chace has seen this dock at New Orleans, he was there for a visit while I had charge of it. In the Dewey a different arrangement has been made—instead of having about 4,000 bolts to connect and disconnect on either side, while you are self-docking a dock is made in that shape, with the side pontoons continuous on both sides, and also through the center, this portion and these two ends are made so that the dock is in its normal position, that is the shape it takes, and when they wish to self-dock they raise this portion and go inside of that portion, and this portion helps that portion up. When this portion is desired to be docked, they pump this as high as they can, and flood this, and lower that, and bring them down into that position, and then pump up and raise this portion of the dock, with these two portions. I think that is the best invention for docks ever invented. It was done by Mr. Hanscom, and I understand he worked it out from the model, and saved himself a great deal of figuring any formula scale like this.

As to pickling, this New Orleans dock was the first dock to be anchored in fresh water, and there were various theories, not only about deterioration, but also painting, and actual practice. Why that dock was not pickled I do not know exactly, but it was not, but the actual experience shows it should have been, and the government is cognizant of that, and I am sure that the error will not be repeated. Also, for some reason, the Dewey dock was not pickled, and I do not know what the experience was for that dock. I know it is the intention of the government to pickle these docks, as the corrosion takes place very rapidly in spots all over the dock; that is, the wetted surface of the dock.

The experience in regard to painting has borne out that in the fresh water the paint does not last any longer than in salt water. People argued that the dock being in fresh water would not require to be repainted, not perhaps for 20 years. That is all wrong.

With regard to the question asked by Prof. Peabody, that is a question

I troubled over a great deal. I have been working on this formula a long time, and several years ago I wrote that down the other way, and after thinking over it, I came to the conclusion that wh cos. effect was greater water surface effect. That is shown by examination, and also by Fig. No. 6. For instance, in heeling a dock you cannot pump all the water out, you must leave some water in, and the amount of water left there, you take some point on the figure, that is some distance from the center. Now, if there were no water at all in that compartment, certainly the capsizing moment in the other direction would be greater, because there is no weight there. Deriving the formula with Sigma i it has been proved in naval architecture that the loss due to Sigma i is independent of the weight of the water. It involves that point. The only proof is this—that water changes its shape, but it acts always through its center of gravity. Going back to first principles, the weight goes through its center of gravity, and therefore if this water is in the compartment, it gives the moment due to the resistance from the side, and if it were not there at all, why the moment in the other direction would be greater. It involves that point.

As to the side walls being built for strength, Prof. Peabody makes that statement in his treatise on naval architecture, and it is correct to assume that, because it makes a greater factor of safety. If the side walls are longer, made of sufficient strength to provide the necessary protection, there would be an additional factor of safety. I have treated it as a single beam fixed together, and a connection between the side walls and center pontoons are all brought into stress and treated exactly as if they were one single beam interconnected throughout, because they are interconnected, and because these disconnections here are weakening points, as shown in the particular case of this breaking. That is to say, it is weaker by these disconnections than it would be without them, so, therefore, by making this continuous, these bolts outside help to strengthen the dock through this section, and a strong dock is the result.

Now, replying to Mr. Donnelly, he speaks of taking care of strains and stresses due to shifting ballast by means of pumping. Of course, that is done. If a ship has a drag, of course you regulate that, not by stopping certain valves in pumping, but you regulate it in only one way in prac-

tice that I know of—and I have had practice in that connection—and where you are pumping you cannot do it when you are pumping up. You can only do it when you are flooding, and the only way to do it when you are flooding on an even keel, when you wish to give a lift to this side, you do it by stopping the valves here, and that shuts off one of the compartments, and the water brings the other compartments throughout at the same level. We cannot shift ballast in the government docks to the same extent they do in commercial practice.

As to the features brought out about neglecting transferred stability by making provision that this compartment shall be watertight, it is perfectly safe, because when he studies over the thing further, he will see that the factor Sigma I that comes in the formula, due to the subdivisions as shown in this data, are so simple that they can be accepted entirely, and they are such as to compensate for transferred stability.

In these lines, these other lines of center side, keel blocks are inserted to support these blocks, and take the weight of the ship at the points where it is needed, to assist in the general strengthening of the dock, and not compensate for the transferred stability, because they are more than necessary to do that. The bulkhead should be watertight in commercial practice, yet in government practice these bulkheads have holes, and these are watertight. This is immaterial, because there is plenty of stability anyhow. In docks of this character there is not much control possible by varying the pumping, except in the fore and aft trim, and that by closing one valve and leaving the other valve open, because all water which is in the pontoons is interconnected in the pontoons and assume a practically level form.

In the discussion of Civil Engineer Cox, Mr. Cox has had perhaps more to do with these docks than many others here—while he has had a great deal to do with the actual details of the Dewey, and this dock—referring to his discussion, he touches upon the towing line, and he says that he would depend more upon a long tow line—that is, he would take more care about that than avoiding square ends to a dock, which is to be towed a long distance. I differ from him on that point very materially, and base my judgment entirely on the testimony of the seagoing officer who handled the Dewey dock when she went to Manila.

He discusses the question of the facility with which the New Orleans dock was towed to New Orleans, it having square ends. It is true that has had square ends, but the builders, partly for the purpose of that towing, built on a round nose to the dock of wood, and it had the effect of having a round nose temporarily.

There is another point in Mr. Cox's discussion in which he says it is very interesting to be able to determine the internal water surfaces over the draught, etc., but it has no particular saving. Of course, we could not get along without a knowledge of that. What he means is this—when the dock is submerged to its greatest submergence, the internal water head comes to about that level. If the dock is entirely submerged, more than that, it never gets higher than that on the inside. Now, the water spaces of the dock include up to that level, so that that space is never used for water ballast, although it is built and liable for that purpose. This space above is used for docking machinery, store rooms of the dock, one on either side, and similar purposes. What he means is this—suppose here, knowing the interior water level, and knowing, therefore, you do not need this for docking purposes, he means that space is not necessary to use for any other purpose, and I will agree in that dock I cannot see any great use for it, because the compartments here are more than ample to take care of the machinery, and also all the stores which it may be desired to put in the dock, and perhaps not more than 25 per cent of this space is used, and not that much for these purposes after the dock is at its naval station. If it is on a voyage, that is different.

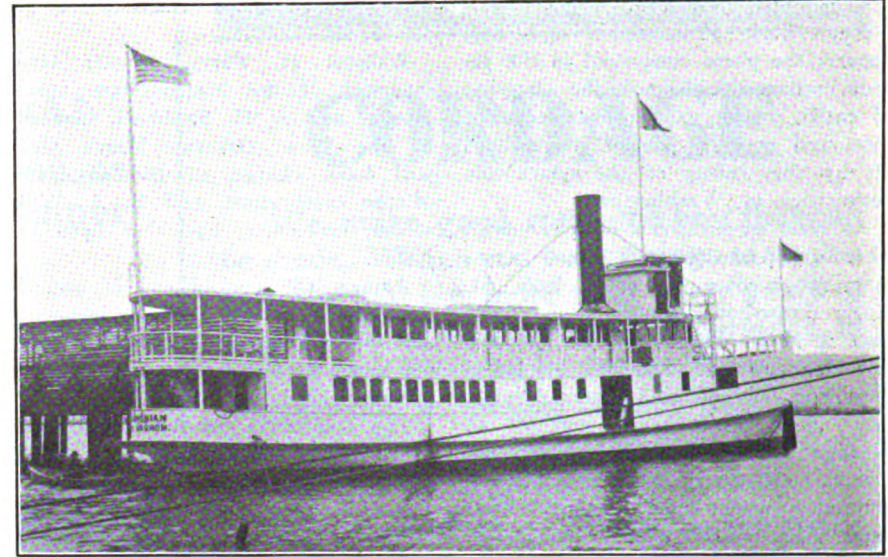
Besides having a value the knowledge of this level is important. Of course, in here (indicating) you do not need this for machinery, unless you want to put in a machine shop, etc., and it might be desirable to put horizontal bars at this level, so when the dock is filled with water completely it would stop here, and remain stable, have reserved stability, even though an accident should happen to the flow and prevent the dock from sinking, in case there was an accident. As a matter of fact, the pumps on this dock will keep going day and night, and the amount of cost of having a man on hand in case of an accident, or a valve failing, is a great expense, whereas, if the dock was so arranged that in case of a valve giving way, or a small leaking should

occur, then the dock would fill up and remain stable and would not have to be watched at such great expense.

The Vice President: In view of the excellence of this paper and the great care which the author has taken in presenting it, I take it for granted that the thanks of the Society are presented to him, and on your behalf I present your thanks to Mr. Roberts for his paper.

VASHONIAN LAUNCHED.

At 9 A. M. Saturday, Dec. 12, the new Puget Sound steamer Vashonian was launched by Philip D. Sloan, at his ship yard on Atlantic street, Seattle. It was one of the most successful launchings in the marine history of Seattle, everything went off on schedule time and without the slightest hitch. The new steamer was tastefully decorated with flags, bunting and a splendid large floral anchor. Miss Grace Gorsuch, of Vashon, Wash., christened the new steamer. The launching was attended by a large number of residents from Vashon Island, who were brought to Seattle on the chartered steamer Venus as guests of the Vashon Steam-



THE VASHONIAN IMMEDIATELY AFTER LAUNCHING.

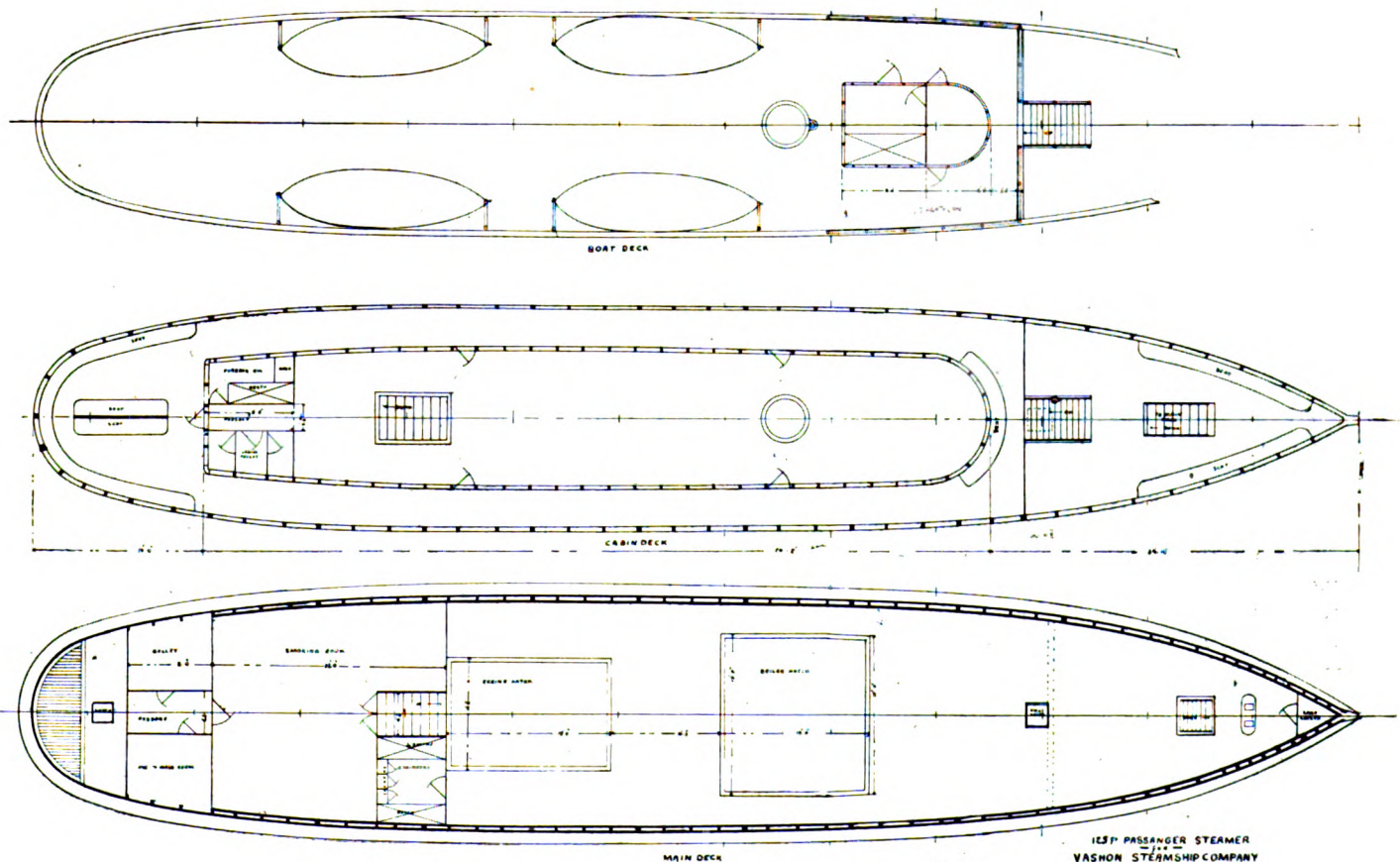
boat Co., owner of the new boat. A. D. Cowen, of Seattle, is president of the company.

The Vashonian, which was fully described in the MARINE REVIEW, Dec. 3, is 125 ft. long, 22 ft. beam, 8 ft. deep and registers 234 gross tons. Her official signal letters assigned by the United States department of commerce and labor are "K. W. S. C." She is fitted with a 700 I. H. P. triple-expansion

engine built by the Northwestern Iron Works, Seattle.

Her trial trip will take place in about 10 days, after which she will be turned over to her owners and commence operating on her regular run between Seattle and Vashon Island.

The hull of the Vashonian was designed by L. H. Coolidge, naval architect, Seattle, and the cabins by Philip D. Sloan.



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RESULTS OF CATTLE EMBARGO.

New York, Philadelphia and Baltimore, the ports concerned in the recent embargo laid upon the shipping of cattle owing to the prevalence of foot and mouth disease, were hard hit by this ruling of the quarantine authorities at Washington.

At least seven lines of steamships were deprived of their usual cargo, viz: White Star Liverpool line, Atlantic Transport London line, Lamport & Holt Manchester line, Wilson line Hull service, Phoenix line, Red Star line, Philadelphia Trans-Atlantic line. New York sends out on an average of 2,000 cattle weekly, the freight charges on which would amount to about \$16,000. Philadelphia ships 1,500 cattle weekly and Baltimore 1,200. At \$8 per head freight the direct loss per week for these three ports amounts to more than \$23,000.

Some of the cattle vessels have been sent to New Orleans and other southern ports for cargoes, but the rule enforced by the British government that no cattle will be admitted on a ship which has touched at a quarantined port within 21 days prevents a speedy compensation for the loss of cattle freights from northern ports.

The hardships of the embargo have affected others than the shippers of cattle, as will be seen in the wording of the original order issued by the United States department of agriculture, bureau of animal industry, which became effective on and after Nov. 29, 1903, quarantining the states of Pennsylvania and New York for the prevention of the spread of the foot and mouth disease, the "interstate or foreign transportation of hides, skins and hoofs of cattle, sheep and other ruminants, and of hay, straw or similar fodder, from a point in the quarantined territory, is absolutely prohibited unless the said hides, skins and hoofs of cattle, sheep and other ruminants, and all hay, straw or similar fodder be disinfected prior to shipment under the supervision of an inspector of the bureau of animal industry."

The railway and steamship companies have taken the orders very literally and as a consequence much delay of goods packed with hay and straw has been experienced.

PLANS FOR HUDSON PAGEANT.

At a recent meeting of the Hudson-Fulton Celebration Committee, in New York. Acting President Herman Ridder announced the committees

which are to have charge of the preparatory work, of which there are 32 in all.

William H. Parry, former stage manager of the Metropolitan Opera House, and A. H. Stoddard, manager of the New Orleans Mardi Gras, will have charge of the pageantry of the celebration, and B. A. Wilkstrom, an artist, has also been engaged.

Among the committees is one on aeronautics, which is to endeavor to arrange for an exhibition of flying machines. There are committees on different kinds of sports.

The committee on the reproduction of the Half Moon, the ship in which Hendrick Hudson sailed up the river which bears his name, reported that Holland had supplied data as to the construction of Hudson's ship which had enabled work to be begun on her. The keel has been laid down at the Royal Naval dock yard at Amsterdam and the vessel will be completed next May. The Half Moon was a three-masted vessel, the fore and main masts rigged with yards, and the mizzen mast with a lateen sail.

The measurements of the original ship, which have been found in the archives of the East Indies Co., and are being reproduced, are: Length, 63 ft.; beam, 17 ft., and a tonnage of 89 tons. The armament will consist of four guns. The vessel is built of oak, and will be quite seaworthy, but in view of the length of the voyage to America she will be navigated to Rotterdam and shipped thence on the deck of one of the Holland-America liners for New York.

Owing to the lack of such data concerning Robert Fulton's steamboat Clermont, plans have not as yet been formulated for reproducing that vessel.

It is believed that the state legislature will appropriate \$300,000 for the celebration on the Hudson river below Newburgh, and \$150,000 for the celebration above that point.

The following were made members of the general committee: Cleveland H. Dodge, James Douglas, Commodore William B. Franklin, Charles H. Heitman, John J. McKelvey, Capt. Aaron Ward, and Major Gen. Leonard A. Wood.

A new committee on hospitality was appointed as follows: George C. Bacheller, W. A. Mahley, D. Leonard Varick, and L. S. A. De Lima. Daniel T. Wella and George N. Moran, former newspaper men, were appointed assistant secretaries.

The celebration is to begin on Sept. 25, 1909, and close on Oct. 2. There will then be an "old-home week," lasting until Oct. 9.

SUBMARINE CONTRACTS.

Secretary of the Navy Newberry awarded contracts Dec. 10, for the construction of eight submarine torpedo boats provided for by the last Congress, bids for which were opened Nov. 2. The awards were made in accordance with the recommendation of the board of construction of the navy department.

If a satisfactory agreement can be made with the owners of the submarine patents it is the intention of the department to construct two of the craft at the Norfolk navy yard. While battleships, cruisers and colliers have been built at the navy yard, the construction of submarines by the government is an innovation. The type of submarines to be built at Norfolk will be determined by the arrangements which the navy department is enabled to make with the owner of the patents.

Four of these new vessels are to be built and delivered on the Pacific coast and it is probable that in case two of the craft should be built at the Norfolk yard they too will be sent to the Pacific coast.

The awards of the contracts were as follows: The Electric Boat Co., Bayonne, N. J., two boats at \$450,450 each, two boats at \$438,900 each, all to be delivered on the Pacific coast; Lake Torpedo Boat Co., Bridgeport, Conn., one boat at \$410,000, to be delivered on the Atlantic coast; American Laurenti Co., Philadelphia, Pa., one boat at \$437,500, to be delivered on the Atlantic coast.

The boat to be furnished by the Lake Torpedo Boat Co., is to be built at the yard of the Newport News Shipbuilding & Dry Dock Co., Newport News, Va., and that to be supplied by the American Laurenti Co. will be built by the William Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.

BIDS FOR SUPPLYING TOWING MACHINES.

Bids opened at the office of the general purchasing agent of the Panama Canal Commission at Washington, D. C., Dec. 9, for supplying 12 towing machines, delivery at Colon on the Isthmus, were as follows: American Ship Windlass Co., Providence, R. I., \$21,875; Chase Machine Co., 2313 Elm street, Cleveland, O., \$22,950.

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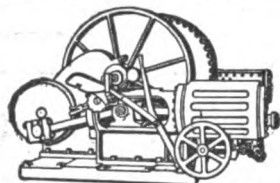
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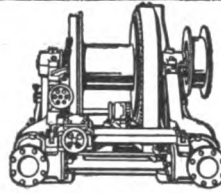
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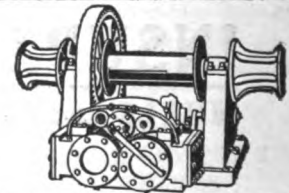
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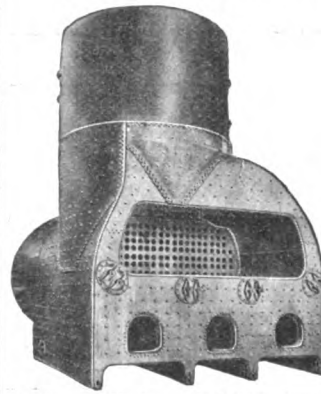
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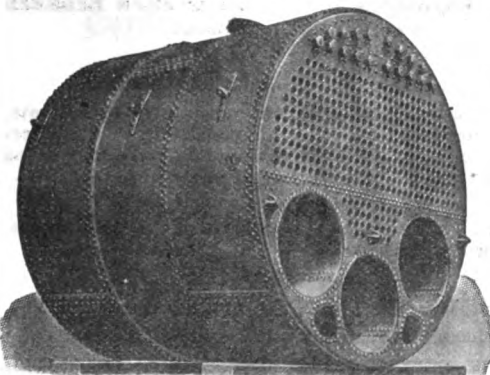
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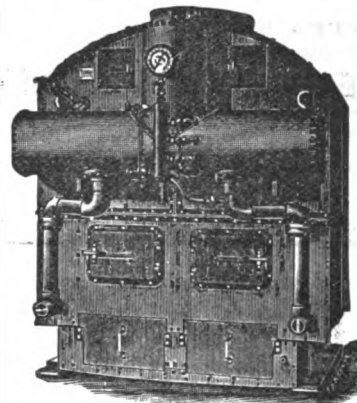
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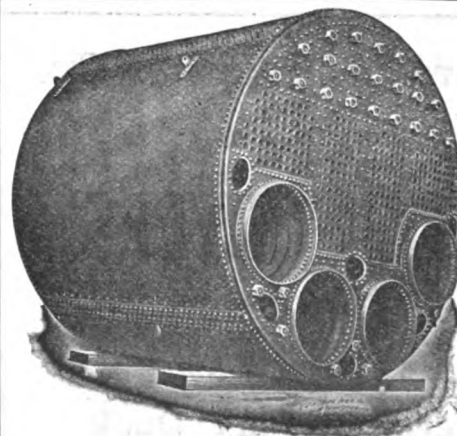
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